

2018-11

# Recreational visits to marine and coastal environments in England: Where, what, who, why, and when?

Elliott, LR

<http://hdl.handle.net/10026.1/12539>

---

10.1016/j.marpol.2018.03.013

Marine Policy

Elsevier

---

*All content in PEARL is protected by copyright law. Author manuscripts are made available in accordance with publisher policies. Please cite only the published version using the details provided on the item record or document. In the absence of an open licence (e.g. Creative Commons), permissions for further reuse of content should be sought from the publisher or author.*

Title: Recreational visits to marine and coastal environments in England: Where, what, who, why, and when?

Lewis R Elliott<sup>\*1</sup>, Mathew P White<sup>1</sup>, James Grellier<sup>1</sup>, Siân Rees<sup>2</sup>, Ruth Waters<sup>3</sup>, & Lora Fleming<sup>1</sup>

\*Corresponding author: Email: L.R.Elliott@exeter.ac.uk.

Address: European Centre for Environment and Human Health,  
University of Exeter, Knowledge Spa, Royal Cornwall Hospital,  
Truro, Cornwall, TR1 3HD, United Kingdom.

<sup>1</sup> European Centre for Environment and Human Health, University of Exeter Medical School, United Kingdom.

<sup>2</sup> Marine Institute, Plymouth University, United Kingdom

<sup>3</sup> Deputy Chief Scientist, Natural England, United Kingdom

## *Abstract*

Health and economic benefits may accrue from marine and coastal recreation. In England, few national-level descriptive analyses exist which examine predictors of recreation in these environments. Data from seven waves (2009-2016) of a representative survey of the English population (n=326,756) were analysed to investigate how many recreational visits were made annually to coastal environments in England, which activities were undertaken on these visits, and which demographic, motivational, temporal, and regional factors predict them. Inland environments are presented for comparison. Approximately 271 million recreational visits were made to coastal environments in England annually, the majority involving land-based activities such as walking. Separately, there were around 59 million instances of water-based recreation undertaken on recreational visits (e.g. swimming, water sports). Visits to the coast involving walking were undertaken by a wide spectrum of the population: compared to woodland walks, for instance, coastal walks were more likely to be made by females, older adults, and individuals from lower socioeconomic classifications, suggesting the coast may support reducing activity inequalities. Motivational and temporal variables showed distinct patterns between visits to coastal and inland comparator environments. Regional variations existed too with more visits to coastal environments made by people living in the south-west and north-east compared to London, where more visits were made to urban open spaces. The results provide a reference for current patterns of coastal recreation in England, and could be considered when making policy-level decisions with regard to coastal accessibility and marine plans. Implications for future public health and marine plans are discussed.

## 1. Introduction

The use of marine (in the sea) and coastal (land adjoining the sea) environments for leisure and recreation is popular worldwide [1] and can potentially confer numerous economic and health benefits. In the UK, marine recreation has an estimated market turnover of £2.74 billion per year and £1.29 billion gross value added [2]. A valuation, conducted in 2012, of England's South West Coast Path (630 miles of waymarked, publicly accessible footpath along the coasts of Devon, Cornwall, and Dorset) attributed a total direct spend of £436m by visitors to regions along its length in that year [3]. Recreational contact with coastal environments has also been associated with the attainment of health-enhancing physical activity [4-7], better general health [8-9], and better mental health [9-10]. An estimated 12.4 million people participated at least once in marine and coastal recreation in the UK in 2015 [11] and in an analysis of the Health Survey for England, such activities were found to have resulted in a national gain of 24,853 quality-adjusted life years (QALYs), the monetary value of which was estimated at £176 million per year [12].

In recognition of the various benefits resulting from marine recreation, Part 9 of the UK Marine and Coastal Access Act 2009 [13] details the objective of creating a continuous, walkable route around England's coastal margins (effectively joining the South West Coast Path discussed above with other stretches of coastline path across the country). The impact assessment of the Act conducted by the Department for Environment, Food and Rural Affairs [14] describes the UK government's priority in securing "*a healthy natural environment for everyone's well-being, health and prosperity*" (p.99). Furthermore, this impact assessment links the government's intervention in marine and coastal accessibility issues directly with the coastal environment's popularity for leisure and recreation: "*The coast is popular for many forms of recreation - beach activities, enjoying scenery, walking, etc.*" (p. 96). To date

however, there appears to be little published evidence that supports these statements with clear quantitative estimates. The majority of the existing literature either focuses on water-based recreational activities rather than recreation in marine and coastal environments more generally, or collapses water-based recreational activities into superordinate categories of 'leisure pursuits' or 'outdoor pursuits,' rendering interpretation difficult [15]. Other papers provide little information on demographic characteristics of those visiting the coastal environments [16]. In short, when compared with routine descriptive analyses of recreation in greenspaces, which use national survey data to identify activities undertaken and the demographic and motivation profile of greenspace visitors [17-19], descriptive analyses of data on the use of marine and coastal environments are limited.

The study presented in this paper was conducted as part of the BlueHealth project [20]. Seven years of data from a large representative survey of the population of England were analysed to examine patterns of usage of coastal environments in terms of key demographic, motivational and temporal variables (compared to key inland natural environments) with the aim of informing marine planning decisions. Results can also be used to contextualise answers to other research questions in marine and coastal policy [21], such as: (a) annually, how many leisure visits were made to coastal environments in England between 2009-2016?; (b) annually, how many leisure visits involved water-based recreational activities in coastal environments?; and (c) what demographic, motivational and temporal factors can predict such visits and activities?

## *2. Material and methods*

### *2.1 Sample*

The data in this study were drawn from waves 1-7 (2009/2010 – 2015/2016) of the Monitor of Engagement with the Natural Environment (MENE) survey [22]. This is an ongoing,

national, repeat cross-sectional survey of the population of England which employs a face-to-face administered interview protocol using a weekly quota-sampling methodology to capture a representative sample of the population of England throughout the year. A total of 326,755 individuals were sampled in the seven waves. In addition to asking a battery of demographic questions, the survey asks respondents to recall the number of leisure visits they made to natural environments in the previous week. If at least one leisure visit was reported (approximately 40% of the total sample), a randomly selected visit in that time frame was followed up with further questioning of details (e.g. the date of the visit, specific type of environment visited, activities undertaken, motivations for visiting, outcomes of visit etc.). Over the first seven waves of the survey, 130,851 such visits were randomly selected for follow-up; these data were used in the current analysis.

Some questions are not asked of all respondents every week. For example, in the first three annual waves of the survey (2009/10 – 2011/12), motivations for visiting natural environments were only asked of one week's sample of respondents per month, whereas they were asked of every respondent in the subsequent four waves of the survey (2012/13 – 2015/16). Weights based on demographic data are provided for each record in the data set such that the sample of visits can be scaled up to be representative of the total population of England's visits. Information on sampling methodology, data collection, and procedures for producing weights have been described in detail previously [22].

## *2.2 Outcomes*

### *2.2.1 'Where'*

Respondents were asked: "Which of the following list of types of place best describe where you spent your time during this visit?" They could choose one of 15 options or select "other." In the present study, we focused primarily on two coastal visit categories: "a beach," and

“other coastline,” and three inland comparator categories: (a) “a river, lake, or canal”; (b) “a park in a town or city” (hereafter ‘urban open spaces’); and (c) “a woodland or forest”. These comparators were chosen to reflect, respectively: (a) the only other primarily aquatic environment in the list; (b) the most visited natural environment in an urban area; and (c) one of the most visited and researched natural environments in a rural area.

Although exploring inland comparator sites may not seem important in a paper aimed at informing marine planning, we believe it is crucial in clarifying what is unique for visitors to marine and coastal environments in terms of demographics, motivations etc.; and thus not only what needs to be considered within a policy/management context to maintain the benefits, but also what opportunities might exist to extend the benefit.

### 2.2.2 ‘What’

Respondents were presented with a list of 20 activities and asked: “Which of these activities, if any, did you undertake?” They could choose as many as were applicable. Four specific water-based activities undertaken in coastal environments (“a beach” and “other coast” combined) were investigated: fishing, water sports, swimming outdoors, and sunbathing/paddling (paddling referring to informal walking in shallow water). Again, to provide context, these were contrasted with the most frequent non-water-based activity, walking (collapsed from the separate activity categories of walking with a dog, and walking without a dog) in both coastal environments and the three key inland environments (see 2.2.1).

## 2.3 Predictors

### 2.3.1 'Who'

Based on previous research using the MENE survey data, we focused on the three demographic variables that have been shown to be the best predictors of leisure visit activities in natural environments: sex (male/female), age, and socioeconomic classification [5]. Age was self-reported by the respondent in terms of one of eight categories though for present purposes this was collapsed into three, reflecting early adulthood, middle adulthood, and late adulthood (16-34 years, 35-64 years, and 65 years and over, respectively). Socioeconomic classification was defined in terms of a social grade variable that is widely used in the UK; this was created post-hoc from answers to other items, and coded in line with a four-category classification developed for use in the National Readership Survey [22]: AB, C1, C2 and DE. AB represents respondents in higher and intermediate managerial, administrative, and professional occupations, C1 represents respondents in supervisory or clerical and junior managerial, administrative or professional occupations, C2 represents those working as skilled manual workers, and DE represents respondents in semi-skilled and unskilled manual occupations; this classification also includes state pensioners, unemployed persons, and lowest grade occupations.

### 2.3.2 'Why'

Regarding visit motivations, respondents were asked: "Which of the following, if any, best describe your reasons for this visit?" Participants could select as many reasons as they wished from a list of 14 (see the MENE technical report for the full list [22]). In this study responses to the options "for health or exercise" and "to relax and unwind" were used to denote 'health' and 'relaxation' motivations respectively. Additionally, responses to the options, "to spend time with family" and "to spend time with friends," were collapsed into a single category to



denote ‘social’ motivations. Such motivations have previously been investigated with regard to outdoor recreation in natural environments [24].

### 2.3.3 *‘When’*

Three temporal variables were also used as predictors. Firstly, each respondent was asked to recall the day on which the randomly selected visit took place. This allowed classification of visits as either being on a weekday or at the weekend. Secondly, the season of the respondent’s visit was deduced from the date of visit as recorded in the MENE survey data: visits made in March-May were classified as ‘spring’ visits, in June-August as ‘summer’ visits, in September-November as ‘autumn’ visits, and in December-February as ‘winter’ visits. Thirdly, survey wave (2009/2010 – 2015/2016) was used as a predictor to observe potential year-on-year differences in visit numbers and recreation participation. These temporal variables have been used previously as important predictors in analyses of the MENE survey data [25].

### 2.3.4 *‘Where’*

Each respondent's home address was identified as being in one of the nine regions of England (East Midlands, East of England, London, North East, North West, South East, South West, West Midlands and Yorkshire and The Humber). The region of residence has been associated with both the odds of achieving recommended levels of physical activity [6] and eudaimonic (meaningfulness, worthwhileness) and experiential subjective well-being [25] in analyses of the MENE survey data previously.

## 2.4 *Statistical Analysis*

Firstly, frequency weights (see 2.1) were used to estimate the average annual number of leisure visits made by adults in England to the two coastal and three comparator

environments (see 2.2.1) according to the demographic, motivational, and temporal predictors listed in section 2.3. The same procedure was used to estimate the average annual number of leisure visits that involved each of the four water-based recreational activities undertaken in coastal environments detailed in section 2.2.2. The final descriptive analysis employed the same procedure to estimate the average annual number of those leisure visits that involved walking in the two coastal and three comparator environments (see 2.2.2).

Secondly, a series of logistic regressions were conducted on pooled data for all seven years (i.e. not disaggregating across each wave). These models predicted: (a) the odds ratios (ORs) that a leisure visit took place in the coastal or comparator environments; (b) the ORs that a leisure visit to a coastal environment involved a water-based recreational activity; and (c) the ORs that a leisure visit involving walking was to either a coastal or one of the three comparator environments (see 2.2.2). All of the predictors listed in section 2.3 were used in all models.

Females and 35-64 year olds were selected as reference categories for sex and age due to being the most frequent subcategories of their respective variables. The AB socioeconomic classification was selected as a reference category in order to observe any differences between higher and lower socioeconomic classifications. For motivational predictors, visits made by respondents who did *not* report that their visit was motivated by health, relaxation, or social reasons were used as reference categories separately. Consistent with previous analyses of MENE survey data [25] weekday visits, winter visits, visits made in the first survey year, and individuals living London were used as reference categories. As frequency weights are unsuitable for inferential analyses, all regressions used unweighted data. All analyses were conducted in R, a programming language and environment for statistical computing [26].

### 3. Results

#### 3.1 *How many people visit coastal settings for recreation, and what do they do there (compared to other natural settings)?*

In total, it is estimated that 171.7 million recreational visits to beaches in England were made annually by adults over 16 (Supplementary Table A). This means 6% of all recreational visits to natural environments included a beach (at least in part). Twenty-four percent of all visits to beaches ( $\approx 41.4$  million visits) involved sunbathing or paddling, the most popular water-based recreational activity undertaken at beaches. Other water-based activities were undertaken substantially less often with swimming outdoors taking place on  $\approx 5.6$  million visits, water sports  $\approx 3.7$  million visits, and fishing  $\approx 1.8$  million visits (Figure 1).

Figure 1 around here.

An estimated 99.3 million visits were made to other coastline environments. This means 3.5% of visits included an 'other coastline' environment, at least in part. Similarly, 'sunbathing or paddling' was the most popular water-based activity undertaken here, undertaken on 11% of all visits to other coastline environments ( $\approx 11.1$  million visits), with other water-based activities undertaken less often (swimming outdoors  $\approx 1.2$  million, water sports  $\approx 2.3$  million, and fishing  $\approx 1.4$  million; see Figure 2). In both coastal settings, the most popular activities undertaken were walking, either with or without a dog, conducted on  $\approx 123.7$  million beach visits annually, and on  $\approx 78.2$  million other coastline visits. Other popular activities in coastal environments included eating or drinking out ( $\approx 27.2$  million beach visits,  $\approx 14.7$  million other coastline visits), playing with children ( $\approx 21.6$  million beach visits,  $\approx 6.1$  million other coastline visits), and visiting an attraction ( $\approx 9.2$  million beach visits,  $\approx 5.8$  million other coastline visits; see Figures 1 and 2).

Figure 2 around here.

Substantially more recreational visits took place to the three inland comparator environments than coastal environments. Rivers, lakes or canals were visited  $\approx 267.4$  million times annually (9% of all recreational visits to natural environments), urban open spaces  $\approx 722.6$  million times (25% of all visits), and woodlands or forests  $\approx 371.2$  million times (13% of all visits). Unsurprisingly, most water-based recreational activities were undertaken less often in all three comparator environments than at coastal environments, except fishing at river, lake, or canal environments ( $\approx 9.9$  million visits); water sports at river, lake, or canal environments ( $\approx 4.5$  million visits); and swimming outdoors in urban open spaces ( $\approx 2.5$  million visits).

Similar to coastal environments, walking was the most popular recreational activity undertaken in all three comparator environments;  $\approx 221.2$  million times at rivers, lakes, or canals;  $\approx 534.1$  million times in urban open spaces; and  $\approx 334.2$  million times at woodlands or forests. Other popular activities undertaken at rivers, lakes, or canals included eating or drinking out ( $\approx 19.4$  million visits), wildlife watching ( $\approx 18.3$  million visits), and playing with children ( $\approx 16.6$  million visits). Other popular activities undertaken in urban open spaces included eating or drinking out ( $\approx 53.4$  million visits), running ( $\approx 33.9$  million visits), and visiting an attraction ( $\approx 19.4$  million visits). Other popular activities undertaken at woodlands or forests included wildlife watching ( $\approx 20.2$  million visits), playing with children ( $\approx 19.6$  million visits), and eating or drinking out ( $\approx 15.2$  million visits).

Supplementary Tables A, B and C present: (a) frequencies of visits to coastal and comparator environments; (b) frequencies of water-based recreational activities undertaken on visits to coastal environments, and; (c) frequencies of walking visits taken to coastal and comparator environments; according to different demographic, motivational, temporal and regional variables. The relative importance of these factors is discussed in section 3.2.

### *3.2 Who visits coastal environments for recreation; why, when, and in which regions?*

Visits to beach environments were more popular among females, those aged 35-64 (compared to 16-34 year olds), and those categorised in the middle two socioeconomic classifications (compared to the highest socioeconomic classification; see Table 1). Beaches were visited more for relaxation and social reasons—and less for health reasons—than for any other reason. Beaches were visited more often at weekends (vs. weekdays), in warmer rather than cooler seasons, and by individuals living in all regions apart from the West Midlands (as compared to London), and in particular those in the North East and South West.

Table 1 around here.

Visits to other coastline environments were more popular among males, older people and people categorised in the highest socioeconomic classification (compared to the lowest socioeconomic classification). Visits to other coastline environments were more often made for relaxation and social reasons. Like beaches, they were also more often visited at weekends, in warmer seasons and by individuals living in all regions compared to London. Again, individuals living in the North East and South West visited other coastline environments particularly often.

While visits to coastal environments showed broadly similar patterns in terms of motivations, temporal characteristics, and regional differences (although not demographics), inland settings showed distinctly different associations. Rivers, lakes or canals were most commonly visited by males, those aged 35-64 (compared to those aged 16-34), and those assigned the highest socioeconomic classification (compared to the two lowest socioeconomic classifications). They were more often visited for health and relaxation reasons (rather than social as with coastal environments). They were also visited more often in summer and spring

(compared to winter); and by individuals living in all regions compared to London, especially the East and West Midlands.

Urban open spaces were visited more often by females, those aged 16-34, and people assigned lower socioeconomic classifications. They were more often made for social reasons, and less often made for relaxation reasons. They were visited more often in warmer seasons, in 2013-2016 (compared to 2009-2010), and by individuals living in London compared to all other regions. Those living in the North East and South West regions visited urban open spaces least often.

Finally, woodlands or forests were more popular among those aged 35-64 (compared to both 16-34 year olds and those aged over 65 years old), and by those categorised as being in the highest socioeconomic classification (compared to all other socioeconomic classifications). Such visits were more often made for reasons of health and relaxation, and less often for social reasons. They were predominantly made in winter (compared to all other seasons), in most later survey years (compared to 2009-2010), and by individuals living in all regions of England compared to London.

### *3.3 Who undertakes water-based recreational activities in coastal environments; why, when, and in which regions?*

Fishing in coastal environments was more popular among males, those aged 35-64 (compared to 16-34 year olds), and those categorised as being in the two lowest socioeconomic classifications (compared to the highest socioeconomic classification; see Table 2). Fishing was more often undertaken for relaxation and social reasons, and less often for health reasons. It was more often undertaken in summer and by individuals living in the East of England, North East, South East, South West and Yorkshire and the Humber (compared to those living in London).

Table 2 around here.

Water sports in coastal environments were more popular among males, those aged 35-64 (compared to those aged 65 and over), and by those categorised as being in the highest socioeconomic classification (compared to the two lowest socioeconomic classifications). They were more often undertaken for relaxation and social reasons and in warmer seasons. Only individuals living in the South West undertook water sports on a visit to a coastal environment more often than those living in the London region.

Swimming in marine and coastal environments was more popular among 16-34 year olds, and less popular among those aged 65 and over (compared to those aged 35-64). It was more often undertaken for relaxation and social reasons and less often for health reasons and in all seasons compared to winter. It was also more popular among individuals living in the South East and South West, and less popular among individuals living in the North West (compared to those living in London). Readers should be cautious in interpreting the large odds ratios here as they may be the result of overfitting the model (see note in Table 2).

Sunbathing or paddling in coastal environments was more popular among females, those aged 35-64 (compared to those aged 65 and over), and by those categorised as being in the second-lowest socioeconomic classification (compared to the highest socioeconomic classification). It was more often undertaken for relaxation and social reasons (less often for health reasons), more commonly undertaken at weekends, less often in winter, and less often in 2013-2014 compared to 2009-2010. Compared to the London region, individuals in all other regions reported higher participation in these activities.

### *3.4 Who undertakes recreational walking in coastal settings; why, when, and in which regions?*

Recreational walking (with or without a dog) was the most popular activity in all environments. In coastal environments, it was more popular among females, older adults, and those in the second-highest socioeconomic classification (compared to the highest socioeconomic classification; Table 3). It was more often undertaken for relaxation and social reasons and at weekends. Londoners reported less recreational walking than individuals in all other regions.

Table 3 around here.

Recreational walking at rivers, lakes, or canals was more popular among females, those aged 35-64 (compared to those aged 16-34), and by those categorised as being in the highest socioeconomic classification (compared to all other socioeconomic classifications). It was more often undertaken for reasons of health and relaxation, and in spring (compared to winter), and less often in autumn (compared to winter). Individuals living in all regions reported more of such walking than individuals living in London.

Recreational walking in urban open spaces was more popular among females, younger adults, and those categorised as being in lower socioeconomic classifications. It was more often undertaken for reasons of health and relaxation, and less often taken for social reasons. It was also more often undertaken on weekdays, in winter (compared to summer), and in all survey years since 2009-2010, except 2011-2012. In contrast to many other activities explored here, individuals living in London took more recreational walks in urban open spaces than those living in any other region.



Finally, recreational walking in woodlands or forests was more popular among females, those aged 35-64 (compared to both younger and older adults), and those categorised as being in the highest socioeconomic classification (compared to all other socioeconomic classifications). It was more often undertaken for health and relaxation reasons and less often for social reasons. It was also more often undertaken in winter (compared to all other seasons), in all survey years since 2009-2010, except 2012-2013, and by individuals living in all regions of England compared to individuals living in London.

#### *4. Discussion*

This study analysed a representative sample of the English population to serve as a reference for decision makers on visits to marine and coastal environments for recreation. Our first research question was: Annually, how many leisure visits were made to coastal environments in England between 2009 and 2016? Approximately 171.7 million such visits were made to beaches and a further 99.3 million to other coastline environments, together meaning that 9.5% of all leisure visits to natural environments involved these locations (notably less than the numbers of leisure visits taken annually to rivers, lakes or canals, urban open spaces and woodlands or forests). Our second research question was: Annually, how many leisure visits involve water-based recreational activities in coastal environments? Approximately 2.9 million involved fishing, 5.6 million involved water sports, 6.1 million involved swimming outdoors and 44.7 million involved sunbathing or paddling. While fishing was more popular at river, lake or canal environments, this clearly demonstrates the importance of marine and coastal environments for supporting water-based recreational activities in England.

Our third research question was: What demographic, motivational and temporal factors predict such visits and activities? Visits to both coastal environments showed similar motivational patterns (both were associated with relaxation and social motivations), temporal

patterns (both were associated with weekend visits and visits in warmer seasons), and regional patterns (individuals living in the North East and South West visited most often). They did however show distinct demographic patterns: beaches were more popular with females in particular with no such sex differences for other coastline environments; beaches were more popular with middle-aged adults, while other coastline environments were more popular among older adults; and beaches were more popular for people categorised as being in lower socioeconomic classifications, with the reverse pattern in other coastline environments. Comparator environments showed clearer socioeconomic patterns: rivers, lakes or canals, and woodlands or forests more popular among people categorised as being in higher socioeconomic classifications, and urban open spaces showing the reverse pattern. Rivers, lakes or canals, and woodlands or forests were associated with health motivations, unlike coastal environments. Woodlands and forests were also more popular in winter, while the other comparator environments showed similar seasonality effects to those of coastal environments. Of note, individuals in London visited urban open spaces more often than individuals living in any other region of England.

All water-based recreational activities in coastal environments appeared to be positively associated with relaxation and social motivations, negatively associated with health motivations (apart from water sports), and be conducted in warmer seasons. 'Sunbathing or paddling' was the only activity undertaken more often at weekends; and the South West was the only region where all such activities were undertaken significantly more often than in London. However, all four showed distinct demographic profiles: fishing popular with older men in lower socioeconomic classifications; water sports popular with younger men in higher socioeconomic classifications; swimming outdoors popular with younger people from all socioeconomic classifications; and sunbathing or paddling popular with middle-aged females in particular with unclear effects for socioeconomic classification.

The profiles of visitors who walked in coastal environments were distinct from those who walked in the comparator environments. While walking visits to all environments were more popular with females, such visits to coastal environments were more popular with older people (compared to other environments), and were more uniform across socioeconomic classifications, which was not observed for comparator environments. Walking in all environments was positively associated with relaxation motivations, but coastal environments were the only ones positively associated with social motivations; all comparator environments showing positive associations with health motivations. Walking in a coastal environment was more often undertaken at weekends, unlike comparators; and walking in all environments was equal across seasons apart from woodlands or forests which were more often visited for walking in winter. While coastal, river, lake, or canal, and woodland or forest environments were more popular with walkers in all regions of England compared to London, urban open spaces were far more popular for walking amongst people from London.

#### *4.1 Implications for public health and well-being*

In previous UK statistics, an estimated 4.7 million *individuals* annually visited the coast to undertake walking [11]. In our analysis, approximately 181.5 million such *visits* take place annually in England (where multiple visits can be made by any given individual). This popularity could give rise to significant public health benefits. Recreational walking, independent of other types of physical activity, is known to have substantial physical health benefits [27] and mental health benefits [28]. It is also established that recreational visits to coastal environments in England typically last longer than visits to other environments [5], meaning that these walking visits could lead to a greater total amount of physical activity being undertaken. Moreover, these visits were popular among demographic groups such as females and older adults who are typically less physically active than their male or younger

counterparts [29]. Although age is sometimes contested as a consistent correlate of physical activity attainment [30], this nonetheless shows that coastal environments could have a role to play in relieving some of the demographic imbalances in physical activity attainment.

Furthermore, such visits were more uniformly distributed across socioeconomic classifications (Table 3), unlike walking visits to rivers, lakes, or canals and woodlands or forests (which favoured higher socioeconomic classifications), and urban parks (which favoured lower socioeconomic classifications). Such equitable use of coastal environments, also demonstrated through the more uniform access to beaches amongst socioeconomic classifications (Table 1), may assist in relieving some of the socioeconomic-related health inequalities which have previously been associated with natural environment access [31].

While less popular activities in coastal environments, swimming and water sports were still undertaken on around 11.7 million visits to coastal environments annually. As many of these activities are classed as approaching high-intensity physical activity [5, 12], they may confer even greater improvements on cardiorespiratory fitness than moderate-intensity activities [32]. Separately, from these physical health benefits, swimming in coastal waters has also been shown to accrete therapeutic benefits through repeated encounters [33].

In spite of these potential benefits, recreational visits to coastal environments were inversely related with health motivations in the case of beaches, and unrelated to health motivations in the case of other coastline environments. This lack of association is repeated even when looking only at walking visits (Table 3). In comparison, river, lake, or canal environments, and woodland or forest environments, consistently demonstrate reported positive associations with health motivations (Tables 1 and 3). It could be concluded therefore, that people are not visiting coastal environments for health promotion motives to the extent we see them in some inland settings. Rather, any health benefits, though in fact substantial, may be perceived as

only subsidiary or incidental, implying that there could be co-benefits to be acquired from such visits. This could be seen as a positive, as promoting physical activity indirectly, rather than as a goal in and of itself, is currently a popular idea in behavioural economics [34].

These positive health implications should be balanced with the fact that other popular recreational activities in coastal environments (compared to the other environments) included picnicking and eating or drinking out, which may adversely affect physical health. The analysis also cannot account for the potentially negative health impacts that could arise from, for example, swimming outdoors or undertaking water sports, e.g. illness [35] or drowning [36].

#### *4.2 Implications for marine policy*

The results of this study should be used as a reference for identifying the current demographic, motivational, temporal, and regional predictors of recreational visits to coastal environments in England, and the types of recreation (marine recreation or otherwise) undertaken there. As an illustration, a marine planner may wish to know how different socioeconomic groups currently use coastal environments for recreation. They would see that, despite numeric differences between the highest and lowest socioeconomic classifications on beach visits, once other predictors have been controlled for, both groups appear equally likely to visit beaches. However, other coastline environments are visited significantly less frequently by people in the lowest socioeconomic classification compared to the highest socioeconomic classification (around 20 million fewer visits per year). Perhaps because of financial constraints, people in the lowest socioeconomic classification do not undertake water sports activities as often as people in the highest socioeconomic classification. If the aim were to increase visits to coastal environments for more socioeconomically deprived populations, a decision maker could thus decide to invest fewer

resources in beach accessibility, and instead focus more efforts into promoting and facilitating visits to other coastline environments and associated recreational activities for this group.

Of course, recreational activities are just one of many sectoral interests taking place in the marine environment that has a specific spatial requirement. The Marine and Coastal Access Act 2009 [13] established a process for the development of Marine Plans across the UK. The UK Marine Policy Statement set the framework for the preparation of Marine Plans to coordinate sectoral interests with guiding high-level marine objectives to: (a) promote sustainable economic development; (b) enable the UK's move towards a low-carbon economy, in order to mitigate the causes of climate change and ocean acidification and adapt to their effects; (c) ensure a sustainable marine environment which promotes healthy, functioning marine ecosystems and protects marine habitats, species and our heritage assets; and, crucially with respect to the current study, (d) contribute to the societal benefits of the marine area, including the sustainable use of marine resources to address local social and economic issues [37].

More specific to recreational use of marine and coastal environments, a key aim for marine policymakers is to integrate Marine Planning with terrestrial planning and coastal communities to promote economic growth and sustain local jobs [37]. The marine policy statement states that: "These considerations must be integrated with social considerations on equality, community cohesion, wellbeing and health, as well as implications for the marine environment" [37] (p. 16). That the current findings demonstrate that compared to key inland natural environments, coastal environments: a) encourage visits from all sectors of society; and b) may be particularly important for promoting social cohesion, suggests that visits to

marine and coastal environments may be particularly good at helping to address these key social issues.

To date, concerted moves have been made to spatially map and value (in economic terms) marine leisure and recreation in order to inform the development of Marine Plans in England [2]. The benefits to health and well-being associated with marine leisure and recreation and their spatial distribution have, however, been neglected in this process. From the perspective of developing marine plans, a descriptive analysis of marine and coastal recreation in terms of “where, what, who, why and when” as presented here is essential. Recreational activities that are most frequently undertaken by the sample, such as walking, confer potential benefits to health and well-being that are (at this stage) unquantified in economic terms. The fact that many members of the public do not intentionally seek out marine and coastal environments for health benefits and yet enjoy leisure and recreational activities in those environments nonetheless further signals a distinct potential undervaluation of the benefits (e.g. they seem to be acting as key locations for relaxation and enhancing social bonds). Care must therefore be taken in the marine planning process to consider the trade-offs between the very direct benefits to human well-being that leisure and recreation activities provide and broader sectoral interests in the marine environment which have tended to dominate to date (e.g. ports, shipping etc.). As well as these co-benefits, planners should further recognise that providing access to leisure and recreation in marine and coastal environments impacts positively not only on the lives of a distinct sectoral group, but rather provides many broader and longer-term societal benefits.

In terms of benefits to health and well-being specifically, there are opportunities to better align Marine Plans with terrestrial planning and regional/local health strategies to ensure that access to the marine and coastal environment for recreation is prioritised for those

communities most in need of the benefits (e.g. areas of deprivation). Additionally, where recreation activities in the marine environment are closely associated with the quality of the natural environment, management plans must ensure that recreational activity does not exceed the carrying capacity of the natural resource and external pressures that could impact upon the quality of the recreation experience (e.g. litter, sewerage) are fully integrated into the planning process in line with the principles of integrated coastal zone management (ICZM) [38].

#### *4.3 Strengths, limitations and future research*

The current research is, to our knowledge, the first population-level study to estimate the frequency of recreational visits to coastal environments in England and provide a contextual backdrop by comparing this information with profiles of key inland natural environment recreational destinations. This comparison clearly shows that the demographic profiles and motives of visits to coastal environments are different from those visits to inland natural environment sites in several potentially important ways.

Despite considerable research on the health benefits of visiting or living near to aquatic environments in general [39-40], descriptive national data on the recreational use of marine and coastal environments had so far been restricted to water-based recreational activity participation rates from health surveys [16]. Notwithstanding the simplicity of the analyses presented here, the results provide a base for considering the impact of, for example, ICZM decisions on recreational visits, or the impact of wider political strategies (e.g. the European Commission's Blue Growth agenda or Water Framework Directive) on recreational visits to marine and coastal environments more generally. The results can also form the evidence base for informing more international collaborative research efforts on the effects of contact with aquatic environments [20].



A limited set of predictor variables were used in analyses. As expected, the model fit statistics demonstrated that such predictors explained little of the variance in these outcome variables suggesting a range of other important determinants that can be explored in further research. However, the choice of these predictors was based on what have been deemed important demographic, motivational and temporal predictors of similar outcomes in previous research [5, 24, 25], as well as what may be most useful for policymakers in making population-level planning decisions, and the variables available in the MENE survey data set. The distance travelled to the visit location could have been used in analysis and may have explained some of the regional variation in the outcome variables, but this variable in particular has been extensively analysed previously [5]. In future research, more localised decisions could be facilitated by local authority-level analysis of the same dataset, to which more locally relevant predictors could be incorporated and more detailed investigation of people's precise motivations beyond the simple categories explored here.

## *5. Conclusions*

Marine and coastal environments in England draw a considerable number of recreational visits every year. The profiles of these visits, in terms of what people do, who goes, why they go, and when they go, are markedly different to that of other natural environments. Thus, marine and coastal environments should be recognised for their uniqueness, especially in supporting visits for demographic groups who may stand to benefit the most from the recreational activities conducted in them, such as women, older people and those in lower socioeconomic classifications. At the same time, the analysis allows policymakers to identify the kinds of people that currently engage with marine and coastal environments less often, such as younger adults; and address other potential concerns, such as why people in certain regions visit such environments less often. This study provides a basic reference for framing of these issues both within future research and in national policies.

## *Acknowledgements*

This work was conducted as part of the BlueHealth project which received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement no. 666773. We thank Alex Smalley for assistance with the creative media materials associated with this paper.

## *References*

- [1] M.L. Paracchini, G. Zulian, L. Kopperoinen, J. Maes, J.P. Schägner, M. Termansen, M. Zandersen, M. Perez-Soba, P.A. Scholefield, G. Bidoglio, Mapping cultural ecosystem services: A framework to assess the potential for outdoor recreation across the EU, *Ecological Indicators*, 45 (2014) 371-385.
- [2] The Scottish Government, Charting progress 2 - productive seas feeder reports: 3.6 Leisure and recreation. <http://www.gov.scot/Resource/Doc/295194/0108024.pdf>, 2010 (accessed 26.05.2017).
- [3] The South West Research Company Ltd, South west coast path monitoring & evaluation framework: Year 2 (2012) key findings summary. [https://www.southwestcoastpath.org.uk/media/uploads/swcp\\_year\\_2\\_analysis\\_summary\\_-\\_key\\_findings\\_final.pdf](https://www.southwestcoastpath.org.uk/media/uploads/swcp_year_2_analysis_summary_-_key_findings_final.pdf), 2012 (accessed 26.05.2017).
- [4] A. Bauman, B. Smith, L. Stoker, B. Bellew, M. Booth, Geographical influences upon physical activity participation: evidence of a 'coastal effect', *Australian and New Zealand Journal of Public Health*, 23 (1999) 322-324.
- [5] L.R. Elliott, M.P. White, A.H. Taylor, S. Herbert, Energy expenditure on recreational visits to different natural environments, *Social Science & Medicine*, 139 (2015) 53-60.

- [6] M.P. White, B.W. Wheeler, S. Herbert, I. Alcock, M.H. Depledge, Coastal proximity and physical activity: Is the coast an under-appreciated public health resource? *Preventive Medicine*, 69 (2014) 135-140.
- [7] K. Witten, R. Hiscock, J. Pearce, T. Blakely. Neighbourhood access to open spaces and the physical activity of residents: a national study. *Preventive Medicine*, 47 (2008) 299-303.
- [8] B.W. Wheeler, M.P. White, W. Stahl-Timmins, M.H. Depledge, Does living by the coast improve health and wellbeing? *Health & Place*, 18 (2012) 1198-1201.
- [9] M.P. White, I. Alcock, B.W. Wheeler, M.H. Depledge, Coastal proximity, health and well-being: Results from a longitudinal panel survey, *Health & Place*, 23 (2013) 97-103.
- [10] M.P. White, S. Pahl, K. Ashbullby, S. Herbert, M.H. Depledge, Feelings of restoration from recent nature visits, *Journal of Environmental Psychology*, 35 (2013) 40-51.
- [11] British Marine, Watersports participation 2015 - executive summary report, <https://britishmarine.co.uk/Resources/Publications/2016/March/Watersports-Participation-2015-Executive-Summary-Report>, 2015 (accessed 07.11.2017).
- [12] E. Papathanasopoulou, M.P. White, C. Hattam, A. Lannin, A. Harvey, A. Spencer, Valuing the health benefits of physical activities in the marine environment and their importance for marine spatial planning, *Marine Policy*, 63 (2016) 144-152.
- [13] UK Government, Marine and coastal access act 2009: Part 9 coastal access: The coastal access duty, <http://www.legislation.gov.uk/ukpga/2009/23/part/9>, 2009 (accessed 26.05.2017).
- [14] Department for Environment, Food, and Rural Affairs, Marine and coastal access act 2009 impact assessment,

<http://webarchive.nationalarchives.gov.uk/20130403001623/http://archive.defra.gov.uk/environment/marine/documents/legislation/marine-ia-0410.pdf>, 2010 (accessed 26.05.2017).

[15] M. Bélanger, N. Townsend, C. Foster, Age-related differences in physical activity profiles of English adults, *Preventive Medicine*, 52 (2011) 247-249.

[16] E. Stamatakis, M. Chaudhury, Temporal trends in adults' sports participation patterns in England between 1997 and 2006: the Health Survey for England, *British Journal of Sports Medicine*, 42 (2008) 901-908.

[17] G. Calogiuri, G.G. Patil, G. Aamodt, Is green exercise for all? A descriptive study of green exercise habits and promoting factors in adult Norwegians, *International Journal of Environmental Research and Public Health*, 13 (2016) 1165.

[18] E.P Flowers, P. Freeman, V.F. Gladwell, A cross-sectional study examining predictors of visit frequency to local green space and the impact this has on physical activity levels, *BMC Public Health*, 16 (2016) 420.

[19] J. Schipperijn, O. Ekholm, U.K. Stigsdotter, M. Toftager, P. Bentsen, F. Kamper-Jørgensen, T.B. Randrup, Factors influencing the use of green space: Results from a Danish national representative survey, *Landscape and Urban Planning*, 95 (2010) 130-137.

[20] J. Grellier, M.P. White, M. Albin, S. Bell, L.R. Elliott, M. Gascón, S. Gualdi, L. Mancini, M.J. Nieuwenhuijsen, D.A. Sarigiannis, M. van den Bosch, T. Wolf, S. Wuijts, L.E. Fleming, BlueHealth: a study programme protocol for mapping and quantifying the potential benefits to public health and well-being from Europe's blue spaces, *BMJ Open*, 7 (2017).

[21] S. Rees, S. Fletcher, G. Glegg, C. Marshall, L. Rodwell, R. Jefferson, M. Campbell et al, Priority questions to shape the marine and coastal policy research agenda in the United Kingdom, *Marine Policy*, 38 (2013) 531-537.

[22] Natural England, Monitor of engagement with the natural environment: The national survey on people and the natural environment: Technical report to the 2009-16 surveys, [https://www.gov.uk/government/uploads/system/uploads/attachment\\_data/file/612705/mene-technical-report-2015-16.pdf](https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/612705/mene-technical-report-2015-16.pdf), 2017, (accessed 27.06.2017).

[23] National Readership Survey, Social Grade, <http://www.nrs.co.uk/nrs-print/lifestyle-and-classification-data/social-grade/>, 2017, (accessed 21.07.2017).

[24] G. Calogiuri, L.R. Elliott. Why do people exercise in natural environments? Norwegian adults' motives for nature-, gym-, and sports-based exercise, *International Journal of Environmental Research and Public Health*, 14 (2017) 377.

[25] M.P. White, S. Pahl, B.W. Wheeler, M.H. Depledge, L.E. Fleming, Natural environments and subjective wellbeing: Different types of exposure are associated with different aspects of wellbeing, *Health & Place*, 45 (2017) 77-84.

[26] R Core Team, R: A language and environment for statistical computing, <https://www.R-project.org/>, 2016, (accessed 26.05.2017).

[27] M. Hamer, Y. Chida, Walking and primary prevention: a meta-analysis of prospective cohort studies, *British Journal of Sports Medicine*, 42 (2007) 238-243.

[28] R. Robertson, A. Robertson, R. Jepson, M. Maxwell, Walking for depression or depressive symptoms: a systematic review and meta-analysis, *Mental Health and Physical Activity*, 5 (2012) 66-75.

- [29] S.G. Trost, N. Owen, A.E. Bauman, J.F. Sallis, W. Brown, Correlates of adults' participation in physical activity: review and update, *Medicine and Science in Sports and Exercise*, 34 (2002) 1996-2001.
- [30] A.E. Bauman, R.S. Reis, J.F. Sallis, J.C. Wells, R.J.F. Loos, B.W. Martin, Lancet Physical Activity Series Working Group, Correlates of physical activity: why are some people physically active and others not? *The Lancet*, 380 (2012) 258-271.
- [31] R. Mitchell, F. Popham, Effect of exposure to natural environment on health inequalities: an observational population study. *The Lancet*, 372 (2008) 1655-1660.
- [32] G. O'Donovan, A. Owen, S.R. Bird, E.M. Kearney, A.M. Nevill, D.W. Jones, K. Woolf-May. Changes in cardiorespiratory fitness and coronary heart disease risk factors following 24 wk of moderate-or high-intensity exercise of equal energy cost. *Journal of Applied Physiology*, 98 (2005) 1619-1625.
- [33] R. Foley. Swimming as an accretive practice in healthy blue space. *Emotion, Space and Society*, 22 (2017) 43-51.
- [34] F.J. Zimmerman, Using behavioral economics to promote physical activity, *Preventive Medicine*, 49 (2009) 289-291.
- [35] A.F.C. Leonard, L. Zhang, A.J. Balfour, R. Garside, W.H. Gaze, Human recreational exposure to antibiotic resistant bacteria in coastal bathing waters, *Environment International*, 82 (2015) 92-100.
- [36] World Health Organization, Global report on drowning: preventing a leading killer, [http://www.who.int/violence\\_injury\\_prevention/global\\_report\\_drowning/en/](http://www.who.int/violence_injury_prevention/global_report_drowning/en/), 2014, (accessed 26.05.2017).

[37] HM Government, UK Marine Policy Statement,  
[https://www.gov.uk/government/uploads/system/uploads/attachment\\_data/file/69322/pb3654-marine-policy-statement-110316.pdf](https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/69322/pb3654-marine-policy-statement-110316.pdf), 2011, (accessed 26.05.2017).

[38] European Commission, Integrated Coastal Management,  
[http://ec.europa.eu/environment/iczm/index\\_en.htm](http://ec.europa.eu/environment/iczm/index_en.htm), 2016, (accessed 25.05.2017).

[39] M. Gascón, W. Zijlema, C Vert, M.P. White, M.J. Nieuwenhuijsen, Outdoor blue spaces, human health and well-being: A systematic review of quantitative studies, *International Journal of Hygiene and Environmental Health*, 220 (2017), 1207-1221.

[40] S. Völker, T. Kistemann, The impact of blue space on human health and well-being—Salutogenetic health effects of inland surface waters: A review, *International Journal of Hygiene and Environmental Health*, 214 (2011) 449-460.

Table 1.

Odds ratios (OR) and 95% confidence intervals (CI) predicting the odds that a visit was to a coastal or comparator environment regressed on a series of demographic and visit characteristics (base n=83,223).

Where		Coastal environments						Inland comparator environments								
		Beach (Yes=6,256) (Cox & Snell=.038) (Nagelkerke=.092)			Other coastline (Yes=3,124) (Cox & Snell=.025) (Nagelkerke=.093)			A river, lake or canal (Yes=7,443) (Cox & Snell=.021) (Nagelkerke=.047)			Urban open spaces (Yes=25,158) (Cox & Snell=.101) (Nagelkerke=.143)			Woodland or forest (n=8,347) (Cox & Snell=.025) (Nagelkerke=.053)		
		OR	95% CI		OR	95% CI		OR	95% CI		OR	95% CI		OR	95% CI	
Who																
	Male=ref	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Female	1.07**	1.02	1.13	0.95	0.89	1.02	0.88***	0.84	0.92	1.11***	1.08	1.15	1.00	0.96	1.05
	Aged 35-64=ref	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Aged 16-34	0.91**	0.85	0.96	0.56***	0.50	0.62	0.87***	0.82	0.92	1.56***	1.51	1.62	0.84***	0.80	0.89
	Aged 65 and over	0.94	0.88	1.01	1.68***	1.54	1.82	1.01	0.95	1.07	0.71***	0.68	0.75	0.74***	0.70	0.79
	AB classification=ref	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	C1 classification	1.11**	1.03	1.19	1.02	0.93	1.12	0.90**	0.84	0.96	1.22***	1.16	1.27	0.90***	0.85	0.96
	C2 classification	1.15***	1.06	1.25	0.92	0.82	1.02	0.94	0.87	1.01	1.29***	1.23	1.35	0.86***	0.80	0.91
	DE classification	1.05	0.97	1.13	0.85**	0.77	0.94	0.85***	0.79	0.91	1.62***	1.55	1.69	0.68***	0.63	0.72
Why																
	Health motivation	0.67***	0.63	0.71	0.96	0.89	1.03	1.33***	1.27	1.40	0.97	0.94	1.01	1.63***	1.55	1.71
	Relaxation motivation	1.71***	1.62	1.81	1.88***	1.74	2.03	1.68***	1.59	1.76	0.95**	0.92	0.98	1.37***	1.31	1.44
	Social motivation	1.55***	1.47	1.63	1.42***	1.32	1.54	1.03	0.98	1.09	1.07***	1.03	1.10	0.87***	0.83	0.92
When																
	Weekday=ref	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Weekend	1.09**	1.03	1.16	1.10*	1.02	1.19	1.05*	1.00	1.11	0.97	0.94	1.00	1.02	0.97	1.07
	Winter=ref	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Spring	1.35***	1.24	1.47	1.12*	1.01	1.25	1.15***	1.07	1.23	1.07**	1.02	1.12	0.92**	0.86	0.98
	Summer	1.79***	1.65	1.93	1.17**	1.05	1.30	1.12**	1.05	1.20	1.12***	1.07	1.17	0.79***	0.74	0.84
	Autumn	1.23***	1.13	1.34	1.11	1.00	1.24	0.96	0.89	1.03	1.10***	1.05	1.16	0.91**	0.85	0.97
	2009-2010=ref	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	2010-2011	0.94	0.80	1.11	0.90	0.72	1.12	0.94	0.80	1.10	1.08	0.98	1.20	1.28***	1.11	1.49
	2011-2012	0.97	0.83	1.14	0.89	0.72	1.10	0.94	0.81	1.09	1.05	0.95	1.16	1.17*	1.02	1.36
	2012-2013	0.96	0.85	1.09	0.93	0.79	1.10	0.89	0.80	1.00	1.05	0.97	1.14	1.11	0.99	1.24
	2013-2014	0.87*	0.79	0.98	0.78**	0.66	0.92	0.96	0.86	1.08	1.15***	1.07	1.24	1.13*	1.01	1.27
	2014-2015	0.92	0.82	1.04	0.86	0.73	1.02	0.97	0.87	1.09	1.20***	1.12	1.30	1.13*	1.01	1.27
	2015-2016	1.02	0.90	1.15	0.84*	0.72	1.00	1.04	0.92	1.16	1.34***	1.24	1.44	1.30***	1.16	1.45



**Where**

<i>London=ref</i>	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
East Midlands	1.62***	1.35	1.93	1.54**	1.14	2.09	3.34***	2.95	3.79	0.20***	0.19	0.21	3.35***	2.94	3.81
East of England	3.00***	2.59	3.48	3.42***	2.67	4.38	2.30***	2.03	2.61	0.28***	0.26	0.30	3.60***	3.18	4.07
North East	7.87***	6.80	9.11	9.11***	7.15	11.62	2.41***	2.08	2.78	0.14***	0.13	0.15	3.50***	3.05	4.03
North West	3.38***	2.94	3.90	5.05***	4.00	6.39	3.05***	2.71	3.44	0.30***	0.28	0.31	2.44***	2.15	2.76
South East	5.79***	5.08	6.61	7.63***	6.09	9.56	2.14***	1.90	2.41	0.21***	0.20	0.22	3.94***	3.51	4.42
South West	5.98***	5.22	6.85	8.23***	6.55	10.35	2.38***	2.10	2.69	0.14***	0.13	0.15	3.77***	3.34	4.26
West Midlands	0.97	0.81	1.17	1.39*	1.04	1.87	4.66***	4.15	5.24	0.33***	0.31	0.35	3.72***	3.29	4.21
Yorkshire and The Humber	4.08***	3.53	4.72	4.33***	3.39	5.53	3.17***	2.80	3.59	0.20***	0.19	0.22	3.69***	3.26	4.18

Notes:

Reference categories for motivations represent respondents who reported that they were not motivated by the corresponding motivation.

\*\*\*  $p < .001$ ; \*\*  $p < .01$ ; \*  $p < .05$ .

Table 2.

Odds ratios (OR) and 95% confidence intervals (CI) predicting the odds that a leisure visit to a coastal environment involved a water-based activity regressed on a series of demographic and visit characteristics (base n=83,223).

[illegible]

<i>London=ref</i>	-	-	-	-	-	-	-	-	-	-	-	-
East Midlands	2.01	0.64	6.26	0.56	0.21	1.53	0.47	0.21	1.07	2.26***	1.72	2.97
East of England	4.75**	1.87	12.05	1.29	0.66	2.55	1.37	0.81	2.30	3.15***	2.47	4.02
North East	4.56**	1.61	12.91	1.48	0.66	3.31	1.11	0.56	2.20	4.50***	3.47	5.84
North West	2.44	0.91	6.53	0.77	0.36	1.63	0.39*	0.19	0.81	2.24***	1.74	2.87
South East	4.38**	1.78	10.74	1.62	0.90	2.90	2.42***	1.59	3.68	5.37***	4.32	6.68
South West	6.06***	2.46	14.92	3.69***	2.12	6.41	3.56***	2.33	5.42	5.06***	4.03	6.36
West Midlands	0.76	0.19	3.06	0.60	0.25	1.45	0.74	0.40	1.36	1.41*	1.06	1.87
Yorkshire and The Humber	4.15**	1.58	10.86	1.37	0.68	2.76	0.73	0.38	1.42	3.55***	2.77	4.53

Notes:

Reference categories for motivations represent respondents who reported that they were not motivated by the corresponding motivation.

Readers should interpret large odds ratios and confidence intervals with caution (e.g. those for the different seasons in relation to coastal outdoor swimming, which appear spurious). These are likely the result of an over-fitted model owing to small cell counts of 'yes' responses in some two-way comparison tables; this is evidenced by lower z values for such predictors compared to predictors with smaller odds ratios (e.g. social motivation for swimming outdoors). Nonetheless, such instances are maintained in the model for comparability with other models in this article.

\*\*\*  $p < .001$ ; \*\*  $p < .01$ ; \*  $p < .05$ .

Table 3.

Odds ratios (OR) and 95% confidence intervals (CI) predicting the odds that a leisure visit involved walking in a coastal or comparator environment regressed on a series of demographic and visit characteristics (base n=83,223).

What		Walking (with or without a dog)											
Where	...in a coastal location			...at a river, lake or canal			...in an urban open space			...in a woodland or forest			
	(Yes=5,676)			(Yes=5,596)			(Yes=16,187)			(Yes=7,074)			
	(Cox & Snell=.039)			(Cox & Snell=.021)			(Cox & Snell=.044)			(Cox & Snell=.024)			
	(Nagelkerke=.100)			(Nagelkerke=.055)			(Nagelkerke=0.70)			(Nagelkerke=.055)			
		OR	95% CI		OR	95% CI		OR	95% CI		OR	95% CI	
Who													
	Male=ref	-	-	-	-	-	-	-	-	-	-	-	-
	Female	1.11***	1.05	1.17	1.08**	1.02	1.14	1.17***	1.13	1.21	1.08**	1.03	1.13
	Aged 35-64=ref	-	-	-	-	-	-	-	-	-	-	-	-
	Aged 16-34	0.68***	0.63	0.73	0.80***	0.75	0.86	1.17***	1.13	1.22	0.79***	0.74	0.84
	Aged 65 and over	1.30***	1.22	1.39	1.04	0.97	1.12	0.90***	0.86	0.94	0.78***	0.73	0.83
	AB classification=ref	-	-	-	-	-	-	-	-	-	-	-	-
	C1 classification	1.10**	1.02	1.19	0.89**	0.82	0.95	1.19***	1.13	1.25	0.91**	0.86	0.97
	C2 classification	1.03	0.95	1.12	0.89**	0.82	0.97	1.23***	1.16	1.30	0.87***	0.81	0.93
	DE classification	0.94	0.87	1.02	0.83***	0.77	0.90	1.49***	1.42	1.57	0.69***	0.64	0.74
Why													
	Health motivation	0.98	0.92	1.03	1.58***	1.50	1.68	1.10***	1.06	1.15	1.61***	1.53	1.70
	Relaxation motivation	1.71***	1.61	1.81	1.66***	1.57	1.76	1.25***	1.20	1.29	1.42***	1.35	1.50
	Social motivation	1.24***	1.17	1.31	0.98	0.93	1.05	0.80***	0.77	0.83	0.80***	0.76	0.85
When													
	Weekday=ref	-	-	-	-	-	-	-	-	-	-	-	-
	Weekend	1.08**	1.02	1.15	1.04	0.98	1.10	0.91***	0.88	0.95	0.99	0.94	1.04
	Winter=ref	-	-	-	-	-	-	-	-	-	-	-	-
	Spring	1.07	0.98	1.16	1.09*	1.00	1.18	0.96	0.92	1.02	0.87***	0.81	0.93
	Summer	1.06	0.98	1.15	0.95	0.88	1.03	0.94*	0.90	0.99	0.74***	0.69	0.79
	Autumn	0.97	0.89	1.05	0.89**	0.81	0.96	0.98	0.93	1.03	0.87***	0.81	0.93
	2009-2010=ref	-	-	-	-	-	-	-	-	-	-	-	-
	2010-2011	0.94	0.78	1.12	1.05	0.88	1.26	1.18**	1.05	1.33	1.38***	1.17	1.61
	2011-2012	0.97	0.82	1.15	1.01	0.85	1.19	1.12	1.00	1.25	1.26**	1.08	1.47
	2012-2013	1.06	0.93	1.21	0.97	0.85	1.11	1.17***	1.07	1.28	1.13	0.99	1.28
	2013-2014	0.91	0.80	1.03	1.05	0.92	1.20	1.31***	1.20	1.43	1.18**	1.04	1.34
	2014-2015	1.01	0.89	1.15	1.05	0.92	1.20	1.32***	1.21	1.44	1.17*	1.03	1.33
	2015-2016	1.02	0.89	1.16	1.14	1.00	1.30	1.37***	1.25	1.50	1.31***	1.16	1.49

**Where**

<i>London=ref</i>	-	-	-	-	-	-	-	-	-	-	-	-
East Midlands	2.49***	1.96	3.16	3.90***	3.32	4.58	0.31***	0.29	0.34	3.59***	3.10	4.16
East of England	4.87***	3.96	5.99	2.95***	2.51	3.46	0.43***	0.40	0.46	3.86***	3.36	4.43
North East	16.94***	13.85	20.71	3.30***	2.77	3.94	0.24***	0.22	0.27	4.05***	3.47	4.73
North West	7.35***	6.03	8.97	3.93***	3.38	4.57	0.48***	0.45	0.50	2.60***	2.26	3.00
South East	11.10***	9.16	13.45	2.73***	2.35	3.18	0.32***	0.30	0.34	4.29***	3.77	4.90
South West	10.91***	8.97	13.25	3.02***	2.58	3.53	0.22***	0.20	0.23	4.14***	3.61	4.74
West Midlands	1.62***	1.27	2.07	6.12***	5.27	7.10	0.55***	0.52	0.59	4.08***	3.55	4.69
Yorkshire and The Humber	7.92***	6.47	9.69	4.27***	3.66	4.99	0.34***	0.31	0.36	4.11***	3.57	4.73

Notes:

Reference categories for motivations represent respondents who reported that they were not motivated by the corresponding motivation.

\*\*\*  $p < .001$ ; \*\*  $p < .01$ ; \*  $p < .05$ .

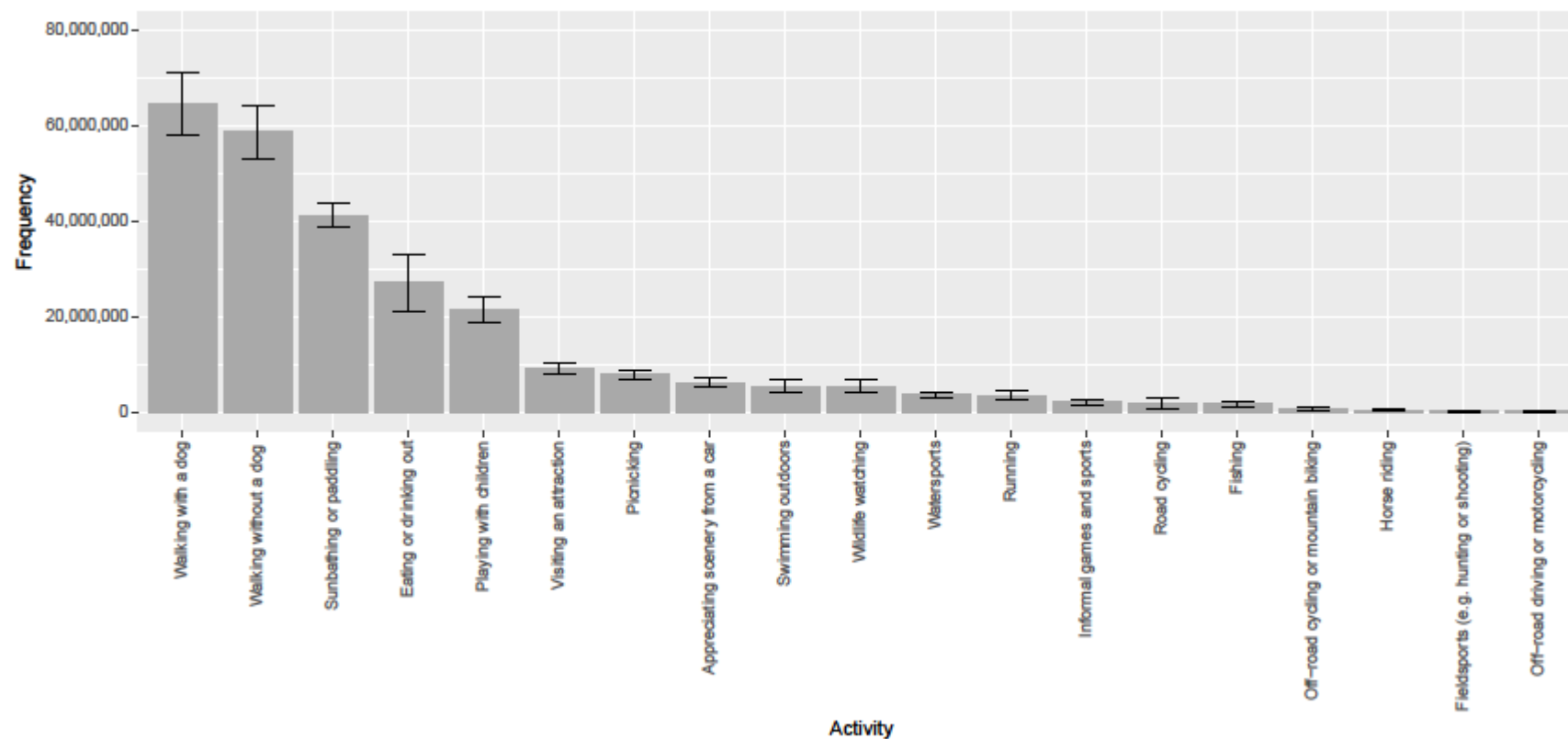


Fig. 1. Annual estimated frequencies of leisure visits to beaches in England taken by the population of England which involve different activities (2009/2010–2015/2016)

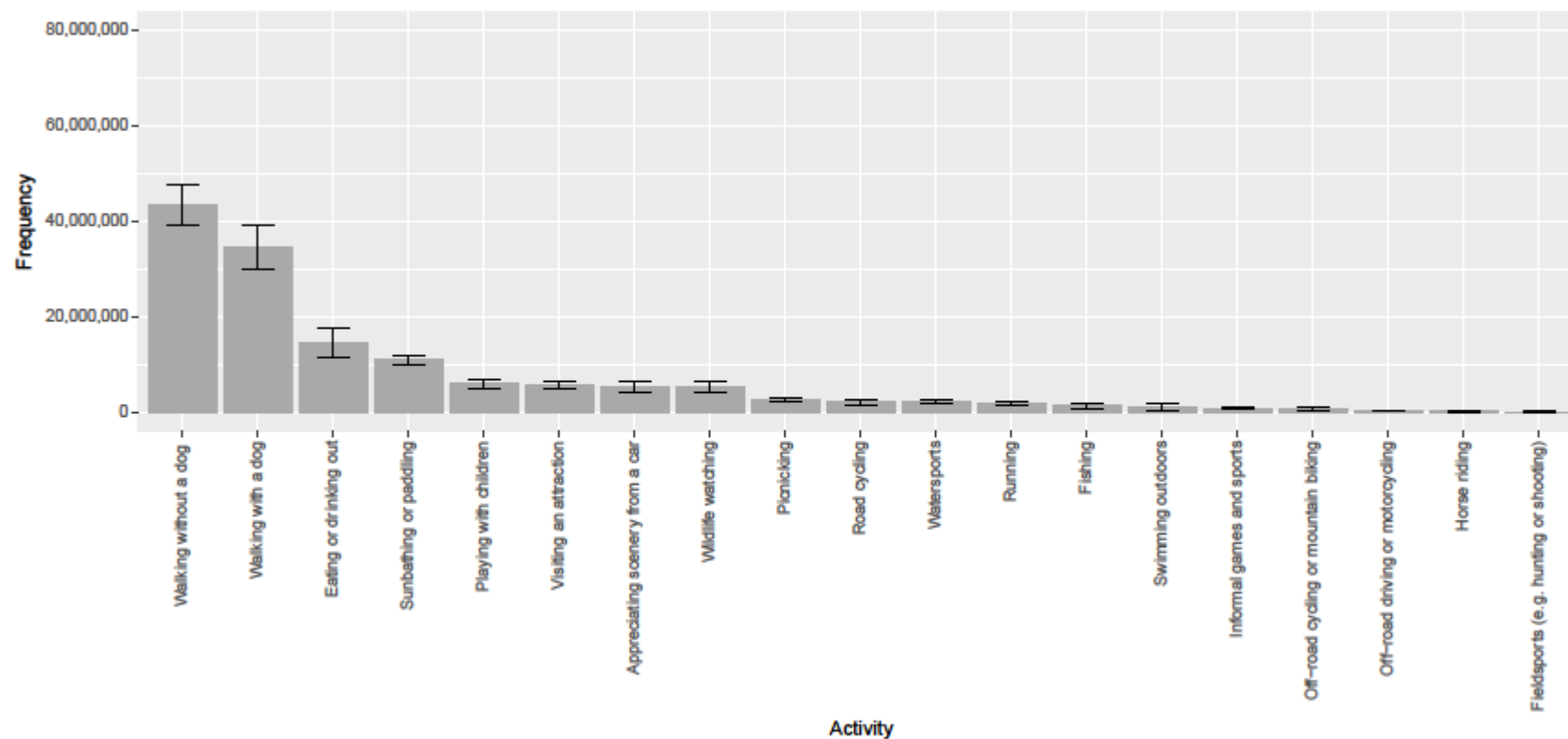


Fig. 2. Annual estimated frequencies of leisure visits to other coastline environments in England taken by the population of England which involve different activities (2009/2010–2015/2016)

Supplementary Table A.

Annual estimates of frequencies of visits to marine and inland comparator environments in England (2009/2010-2015/2016).

Where	Marine environments					Inland comparator environments					
	Beach		Other coastline		River, lake or canal		Urban open spaces		Woodland or forest		
	N	%	N	%	N	%	N	%	N	%	
	Std Error		Std Error		Std Error		Std Error		Std Error		
Total	171,746,361	6.0	99,269,907	3.5	267,439,776	9.3	722,599,787	25.2	371,205,087	12.9	
SE	6,660,707	3.9	4,001,690	4.0	11,549,557	4.3	42,746,668	5.9	16,636,832	4.5	
What											
Fishing	1,768,072	1.0	1,416,131	1.4	9,858,463	3.7	890,684	0.1	1,056,928	0.3	
SE	226,297	0.1	227,245	0.2	492,666	0.2	259,979	0.0	132,980	0.0	
Water sports	3,716,981	2.2	2,287,076	2.3	4,526,916	1.7	1,216,908	0.2	448,418	0.1	
SE	357,233	0.2	226,371	0.2	424,289	0.2	67,591	0.0	60,429	0.0	
Swimming outdoors	5,607,808	3.3	1,209,487	1.2	1,181,872	0.4	2,500,555	0.3	539,231	0.1	
SE	657,510	0.4	355,790	0.4	199,489	0.1	293,975	0.0	187,264	0.1	
Sunbathing or paddling	41,392,488	24.1	11,073,846	11.2	1,751,606	0.7	3,435,263	0.5	1,372,762	0.4	
SE	1,255,509	0.7	541,050	0.5	210,132	0.1	284,957	0.0	114,124	0.0	
Walking without a dog	58,880,527	34.3	43,421,756	43.7	86,834,570	32.5	225,866,263	31.3	79,903,430	21.5	
SE	2,881,889	1.7	2,142,047	2.2	4,198,341	1.6	14,178,819	2.0	4,925,991	1.3	
Walking with a dog	64,813,307	37.7	34,746,205	35.0	134,349,663	50.2	308,256,018	42.7	254,338,690	68.5	
SE	3,348,687	1.9	2,417,684	2.4	7,070,821	2.6	19,970,629	2.8	11,281,707	3.0	
Playing with children	21,569,831	12.6	6,060,124	6.1	16,592,605	6.2	125,187,073	17.3	19,586,083	5.3	
SE	1,422,249	0.8	518,816	0.5	1,200,918	0.4	9,321,777	1.3	1,754,522	0.5	
Visiting an attraction	9,224,676	5.4	5,774,626	5.8	8,846,703	3.3	19,383,967	2.7	7,774,497	2.1	
SE	645,845	0.4	379,953	0.4	476,300	0.2	1,133,439	0.2	540,451	0.1	
Running	3,625,990	2.1	2,011,941	2.0	9,117,437	3.4	33,949,020	4.7	9,521,086	2.6	
SE	428,017	0.2	205,423	0.2	753,594	0.3	3,621,158	0.5	1,281,384	0.3	
Road cycling	2,056,016	1.2	2,318,866	2.3	6,864,731	2.6	13,920,819	1.9	6,028,971	1.6	
SE	565,709	0.3	290,982	0.3	520,556	0.2	1,189,503	0.2	422,255	0.1	
Off-road cycling or mountain biking	695,368	0.4	823,240	0.8	5,607,321	2.1	5,323,101	0.7	8,475,807	2.3	
SE	161,551	0.1	228,728	0.2	478,460	0.2	709,065	0.1	795,979	0.2	
Informal games and sports	2,148,202	1.3	949,623	1.0	1,919,343	0.7	18,451,341	2.6	2,554,345	0.7	
SE	302,455	0.2	130,051	0.1	313,105	0.1	627,329	0.1	397,399	0.1	
Off-road driving or motorcycling	299,718	0.2	331,104	0.3	510,051	0.2	734,802	0.1	809,113	0.2	
SE	76,432	0.0	55,318	0.1	166,281	0.1	149,191	0.0	86,464	0.0	
Horse riding	577,782	0.3	245,653	0.2	912,417	0.3	914,130	0.1	4,925,267	1.3	



	SE	130,103	0.1	67,261	0.1	216,072	0.1	238,419	0.0	773,781	0.2
Fieldsports (e.g. hunting or shooting)		327,206	0.2	195,990	0.2	363,696	0.1	2,631,946	0.4	1,656,723	0.4
	SE	94,410	0.1	85,120	0.1	99,477	0.0	310,229	0.0	316,145	0.1
Eating or drinking out		27,200,565	15.8	14,701,665	14.8	19,361,009	7.2	53,375,378	7.4	15,214,342	4.1
	SE	2,958,568	1.7	1,515,621	1.5	1,983,713	0.7	7,155,366	1.0	2,348,191	0.6
Wildlife watching		5,555,668	3.2	5,361,183	5.4	18,335,690	6.9	12,064,344	1.7	20,155,710	5.4
	SE	647,893	0.4	650,986	0.7	1,000,169	0.4	768,128	0.1	1,298,307	0.3
Appreciating scenery from a car		6,324,985	3.7	5,413,754	5.5	6,855,768	2.6	6,080,594	0.8	6,536,837	1.8
	SE	505,949	0.3	550,209	0.6	796,131	0.3	818,684	0.1	918,617	0.2
Picnicking		7,959,170	4.6	2,814,058	2.8	7,152,002	2.7	16,286,287	2.3	6,556,848	1.8
	SE	462,381	0.3	211,239	0.2	708,396	0.3	1,138,739	0.2	439,840	0.1
<b>Who</b>											
	Male	78,521,438	45.7	50,535,125	50.9	133,919,074	50.1	343,533,818	47.5	180,119,178	48.5
	SE	3,099,075	1.8	1,812,778	1.8	5,533,721	2.1	21,790,647	3.0	10,506,076	2.8
	Female	93,224,923	54.3	48,734,782	49.1	133,520,702	49.9	379,065,969	52.5	191,085,909	51.5
	SE	3,919,827	2.3	2,532,641	2.6	6,351,178	2.4	21,359,700	3.0	7,826,937	2.1
	Aged 16-34	42,614,637	24.8	14,820,902	14.9	59,495,676	22.2	256,859,161	35.5	77,241,014	20.8
	SE	1,544,778	0.9	898,534	0.9	3,546,648	1.3	12,632,311	1.7	5,154,316	1.4
	Aged 35-64	98,664,072	57.4	55,967,003	56.4	158,515,729	59.3	365,075,139	50.5	231,333,098	62.3
	SE	3,340,726	1.9	1,734,188	1.7	4,815,027	1.8	21,131,794	2.9	7,227,011	1.9
	Aged 65 and over	30,467,652	17.7	28,482,003	28.7	49,428,371	18.5	100,665,487	13.9	62,630,975	16.9
	SE	2,498,301	1.5	2,590,037	2.6	3,835,238	1.4	9,971,223	1.4	5,865,763	1.6
	AB classification	53,670,836	31.3	35,142,533	35.4	93,043,091	34.8	196,811,600	27.2	132,008,235	35.6
	SE	3,417,078	2.0	1,974,672	2.0	5,615,305	2.1	17,444,865	2.4	8,820,785	2.4
	C1 classification	51,186,978	29.8	31,094,406	31.3	75,084,545	28.1	217,841,626	30.1	106,861,164	28.8
	SE	2,111,664	1.2	1,750,432	1.8	3,817,115	1.4	14,094,308	2.0	6,225,237	1.7
	C2 classification	35,294,274	20.6	18,601,795	18.7	51,856,887	19.4	142,266,325	19.7	74,967,379	20.2
	SE	1,874,336	1.1	793,049	0.8	2,516,577	0.9	7,729,179	1.1	3,430,676	0.9
	DE classification	31,594,272	18.4	14,431,173	14.5	47,455,253	17.7	165,680,236	22.9	57,368,308	15.5
	SE	1,651,723	1.0	989,015	1.0	2,249,990	0.8	8,375,749	1.2	1,989,493	0.5
<b>Why</b>											
	Health motivation	60,948,310	35.5	46,988,988	47.3	132,728,926	49.6	266,657,981	36.9	206,028,062	55.5
	SE	5,638,471	3.3	4,297,248	4.3	10,265,072	3.8	31,194,784	4.3	20,694,077	5.6
	Relaxation motivation	69,877,914	40.7	46,825,479	47.2	105,695,623	39.5	198,164,532	27.4	140,779,029	37.9
	SE	4,568,016	2.7	4,487,417	4.5	4,292,205	1.6	19,997,706	2.8	12,227,444	3.3
	Social motivation	64,192,709	37.4	30,452,437	30.7	66,870,782	25.0	192,396,461	26.6	78,078,370	21.0

	SE	3,873,166	2.3	4,313,935	4.3	6,521,183	2.4	14,839,172	2.1	5,972,503	1.6
<b>When</b>											
	Weekday	107,807,298	62.8	63,518,884	64.0	173,715,229	65.0	478,853,153	66.3	249,635,788	67.3
	SE	10,157,543	5.9	5,317,263	5.4	15,039,955	5.6	42,162,419	5.8	19,657,286	5.3
	Weekend	63,939,063	37.2	35,751,023	36.0	93,724,547	35.0	243,746,634	33.7	121,569,299	32.7
	SE	5,095,260	3.0	2,550,010	2.6	4,756,523	1.8	14,003,613	1.9	5,795,431	1.6
	Spring	47,392,909	27.6	27,310,626	27.5	77,063,949	28.8	191,759,241	26.5	102,310,039	27.6
	SE	3,219,152	1.9	2,105,417	2.1	4,884,965	1.8	12,987,129	1.8	4,185,516	1.1
	Summer	57,639,219	33.6	29,482,233	29.7	79,337,587	29.7	203,776,031	28.2	93,757,030	25.3
	SE	2,599,238	1.5	1,757,600	1.8	4,209,107	1.6	14,667,037	2.0	6,489,376	1.7
	Autumn	36,371,717	21.2	22,211,426	22.4	59,396,743	22.2	174,647,211	24.2	87,718,205	23.6
	SE	2,035,966	1.2	1,303,571	1.3	2,966,740	1.1	13,185,642	1.8	5,767,216	1.6
	Winter	30,342,516	17.7	20,265,621	20.4	51,641,497	19.3	152,417,303	21.1	87,419,812	23.6
	SE	2,345,683	1.4	1,657,529	1.7	2,293,586	0.9	11,111,724	1.5	7,168,437	1.9
											0.0
	2009-2010	174,136,792	14.5	98,189,027	14.1	253,373,405	13.5	677,631,562	13.4	316,825,027	12.2
	2010-2011	159,082,923	13.2	91,080,034	13.1	231,907,307	12.4	557,838,987	11.0	325,553,892	12.5
	2011-2012	151,792,199	12.6	90,023,921	13.0	261,436,449	14.0	628,383,823	12.4	358,313,925	13.8
	2012-2013	170,437,233	14.2	94,794,997	13.6	251,802,843	13.5	709,861,662	14.0	356,574,704	13.7
	2013-2014	157,015,289	13.1	92,980,896	13.4	269,188,419	14.4	778,178,986	15.4	377,758,261	14.5
	2014-2015	192,640,330	16.0	117,820,620	17.0	275,315,110	14.7	827,056,830	16.4	417,048,210	16.0
	2015-2016	197,119,758	16.4	109,999,856	15.8	329,054,900	17.6	879,246,657	17.4	446,361,588	17.2
<b>Where</b>											
	East Midlands	6,715,543	3.9	3,192,014	3.2	28,350,541	10.6	46,847,056	6.5	32,032,971	8.6
	SE	573,189	0.3	273,450	0.3	2,533,746	0.9	2,494,202	0.3	1,573,324	0.4
	East of England	14,593,425	8.5	7,536,860	7.6	25,966,519	9.7	72,604,523	10.0	45,752,363	12.3
	SE	936,160	0.5	469,300	0.5	1,651,848	0.6	6,712,310	0.9	2,819,785	0.8
	London	5,656,454	3.3	2,020,105	2.0	10,271,386	3.8	159,527,509	22.1	12,054,776	3.2
	SE	609,585	0.4	390,016	0.4	1,313,937	0.5	13,721,832	1.9	1,819,351	0.5
	North East	22,446,912	13.1	10,644,700	10.7	13,086,101	4.9	29,394,361	4.1	26,813,751	7.2
	SE	1,126,242	0.7	1,312,012	1.3	1,256,022	0.5	1,432,840	0.2	2,758,471	0.7
	North West	19,984,759	11.6	12,841,663	12.9	33,329,466	12.5	104,570,588	14.5	30,140,739	8.1
	SE	940,514	0.5	449,275	0.5	2,671,438	1.0	7,218,190	1.0	3,373,807	0.9
	South East	40,344,147	23.5	25,479,740	25.7	34,797,069	13.0	97,026,417	13.4	69,751,311	18.8
	SE	4,340,121	2.5	2,553,287	2.6	1,728,498	0.6	5,791,542	0.8	4,820,494	1.3
	South West	35,298,995	20.6	24,543,982	24.7	35,477,201	13.3	57,593,820	8.0	58,938,363	15.9
	SE	2,241,980	1.3	1,038,662	1.0	2,824,875	1.1	4,446,514	0.6	2,598,655	0.7

West Midlands	5,983,119	3.5	2,721,133	2.7	46,053,883	17.2	81,189,673	11.2	43,615,894	11.7
SE	366,410	0.2	336,625	0.3	4,170,575	1.6	4,860,210	0.7	3,728,036	1.0
Yorkshire and The Humber	16,091,165	9.4	7,568,348	7.6	34,472,082	12.9	55,248,833	7.6	44,930,363	12.1
SE	1,091,352	0.6	386,318	0.4	1,395,657	0.5	2,813,561	0.4	3,417,902	0.9

Notes:

Percentages for activities and motivations can add up to greater than 100% as respondents could select more than one activity or motivation item (see section 2.2.2 and 2.3.2).

Section 2.2.2 of the main article states that a list of twenty activities could be selected, and only nineteen are present here. The twentieth refers to an "any other outdoor activity" option which was omitted from analyses as it was deemed less helpful to marine planners and other potential readers of these analyses.

Counts for the survey year variable are annual totals (i.e. the estimated number of visits to the location in that year of sampling). Every other variable represents an annual average (i.e. the average number of visits to that location over the seven years of sampling involving that activity, motivation, season etc.).

Standard errors of the mean represent standard errors across the 7 survey sampling years. Therefore, no standard errors are present for the survey year variable.

Grossing-up weights are applied to estimate frequencies at the English population level. These estimates are made from a total sample size of 130,851 randomly selected visits made in the previous week (each made by a different respondent) over the last seven years of the survey's data collection except for the three motivation variables which are estimated from 30,188 such visits. The reason that this number is less than the total is because these items were only asked every month for the former three waves of the survey. For more information on the weighting procedures and how the grossing-up weights were constructed, see the recent technical report on the survey [20].

Supplementary Table B.

Annual estimates of frequencies of water-based activities on leisure visits to marine environments in England (2009/2010-2015/2016).

What	Fishing		Water sports		Swimming outdoors		Sunbathing or paddling	
	N	%	N	%	N	%	N	%
	Std Error		Std Error		Std Error		Std Error	
<b>Total</b>	2,917,745	0.1	5,594,693	0.2	6,148,838	0.2	44,651,703	1.6
<b>SE</b>	310,032	10.6	524,542	9.4	755,827	12.3	1,355,453	3.0
<b>Who</b>								
Male	2,278,029	78.1	3,904,812	69.8	3,042,911	49.5	19,034,405	42.6
SE	249,325	8.5	407,297	7.3	386,135	6.3	980,379	2.2
Female	639,716	21.9	1,689,881	30.2	3,105,927	50.5	25,617,298	57.4
SE	129,063	4.4	166,062	3.0	384,789	6.3	485,020	1.1
Aged 16-34	607,301	20.8	1,798,348	32.1	2,805,297	45.6	12,954,833	29.0
SE	178,671	6.1	254,862	4.6	492,275	8.0	915,279	2.0
Aged 35-64	1,960,787	67.2	3,385,570	60.5	2,962,335	48.2	25,005,778	56.0
SE	197,474	6.8	287,889	5.1	314,815	5.1	673,504	1.5
Aged 65 and over	349,658	12.0	410,775	7.3	381,206	6.2	6,691,092	15.0
SE	86,295	3.0	61,547	1.1	138,870	2.3	512,395	1.1
AB classification	846,014	29.0	2,317,310	41.4	1,937,366	31.5	14,737,594	33.0
SE	186,263	6.4	338,866	6.1	309,848	5.0	1,234,061	2.8
C1 classification	786,070	26.9	1,614,596	28.9	1,890,078	30.7	13,428,244	30.1
SE	198,776	6.8	141,296	2.5	210,601	3.4	790,160	1.8
C2 classification	632,352	21.7	1,053,735	18.8	1,246,229	20.3	9,733,535	21.8
SE	118,841	4.1	116,002	2.1	261,069	4.2	472,758	1.1
DE classification	653,309	22.4	609,052	10.9	1,075,165	17.5	6,752,331	15.1
SE	159,114	5.5	135,045	2.4	210,648	3.4	359,414	0.8
<b>Why</b>								
Health motivation	278,271	9.5	2,271,664	40.6	3,087,815	50.2	14,149,388	31.7
SE	152,868	5.2	629,987	11.3	331,904	5.4	1,537,084	3.4
Relaxation motivation	1,639,610	56.2	2,498,393	44.7	3,662,599	59.6	26,104,311	58.5
SE	289,782	9.9	452,960	8.1	464,004	7.5	1,706,851	3.8
Social motivation	1,358,115	46.5	2,109,306	37.7	4,632,941	75.3	27,888,276	62.5
SE	373,552	12.8	476,401	8.5	629,627	10.2	2,135,223	4.8
<b>When</b>								
Weekday	1,702,477	58.3	3,059,661	54.7	3,535,381	57.5	25,449,692	57.0

	SE	264,551	9.1	307,326	5.5	611,923	10.0	2,566,410	5.7
	Weekend	1,215,268	41.7	2,535,032	45.3	2,613,457	42.5	19,202,011	43.0
	SE	231,762	7.9	345,536	6.2	419,735	6.8	1,678,368	3.8
	Spring	673,521	23.1	1,399,637	25.0	1,029,229	16.7	12,784,492	28.6
	SE	142,063	4.9	293,492	5.2	191,294	3.1	1,266,131	2.8
	Summer	1,168,675	40.1	2,458,505	43.9	4,168,640	67.8	19,531,036	43.7
	SE	150,822	5.2	331,404	5.9	565,415	9.2	1,257,561	2.8
	Autumn	761,781	26.1	1,246,362	22.3	854,355	13.9	8,547,541	19.1
	SE	93,212	3.2	130,317	2.3	144,649	2.4	568,835	1.3
	Winter	313,768	10.8	490,189	8.8	96,614	1.6	3,788,634	8.5
	SE	70,879	2.4	177,916	3.2	50,111	0.8	285,195	0.6
	2009-2010	2,639,674	12.9	7,354,867	18.8	7,491,347	17.4	42,299,849	13.5
	2010-2011	4,016,012	19.7	6,680,613	17.1	6,152,642	14.3	46,002,236	14.7
	2011-2012	4,031,682	19.7	5,453,979	13.9	5,148,079	12.0	44,767,764	14.3
	2012-2013	2,785,306	13.6	6,667,025	17.0	4,040,510	9.4	41,153,318	13.2
	2013-2014	2,099,540	10.3	5,283,588	13.5	9,158,208	21.3	40,277,817	12.9
	2014-2015	2,012,460	9.9	3,902,900	10.0	3,666,600	8.5	48,831,460	15.6
	2015-2016	2,839,543	13.9	3,819,877	9.8	7,384,480	17.2	49,229,477	15.8
<hr/>									
<b>Where</b>									
	East Midlands	107,029	3.7	134,207	2.4	200,079	3.3	3,144,170	7.0
	SE	49,486	1.7	44,807	0.8	80,075	1.3	154,538	0.3
	East of England	303,637	10.4	447,285	8.0	610,834	9.9	4,521,428	10.1
	SE	53,444	1.8	95,661	1.7	132,150	2.1	373,859	0.8
	London	186,247	6.4	519,337	9.3	805,831	13.1	1,829,601	4.1
	SE	80,552	2.8	79,168	1.4	151,693	2.5	184,477	0.4
	North East	239,253	8.2	207,704	3.7	252,867	4.1	3,101,963	6.9
	SE	86,664	3.0	71,695	1.3	99,633	1.6	296,789	0.7
	North West	300,520	10.3	348,222	6.2	203,508	3.3	3,479,342	7.8
	SE	57,477	2.0	69,860	1.2	69,197	1.1	296,203	0.7
	South East	448,013	15.4	943,835	16.9	1,515,146	24.6	11,286,200	25.3
	SE	95,138	3.3	214,478	3.8	297,088	4.8	906,275	2.0
	South West	824,972	28.3	2,150,600	38.4	1,578,936	25.7	8,467,505	19.0
	SE	150,118	5.1	271,599	4.9	264,325	4.3	405,857	0.9
	West Midlands	167,158	5.7	336,477	6.0	452,533	7.4	3,095,842	6.9
	SE	64,344	2.2	118,307	2.1	130,306	2.1	189,222	0.4
	Yorkshire and The Humber	232,108	8.0	371,914	6.6	282,774	4.6	4,338,303	9.7

SE	36,792	1.3	105,093	1.9	106,074	1.7	390,336	0.9
----	--------	-----	---------	-----	---------	-----	---------	-----

Notes:

Percentages for motivations can add up to greater than 100% as respondents could select more than one motivation item (see section 2.3.2).

Counts for the survey year variable are annual totals (i.e. the estimated number of visits to the location in that year of sampling). Every other variable represents an annual average (i.e. the average number of visits to that location over the seven years of sampling involving that activity, motivation, season etc.).

Standard errors of the mean represent standard errors across the 7 survey sampling years. Therefore, no standard errors are present for the survey year variable.

Grossing-up weights are applied to estimate frequencies at the English population level. These estimates are made from a total sample size of 130,851 randomly selected visits made in the previous week (each made by a different respondent) over the last seven years of the survey's data collection except for the three motivation variables which are estimated from 30,188 such visits. The reason that this number is less than the total is because these items were only asked every month for the former three waves of the survey. For more information on the weighting procedures and how the grossing-up weights were constructed, see the recent technical report on the survey [20].

Total counts for the four activities do not add up to the same frequencies that would result from adding the counts for the four different activities in 'beach' and 'other coastline' environments from Table 1. This is due to the collapsing of these two locations into one variable (and subsequently averaging counts of the four activities across the seven survey years in this manner).

Annual estimates of frequencies of walking on leisure visits to marine and comparator environments in England (2009/2010-2015/2016).

What		Walking (with or without a dog)							
Where		... in a marine location		... at a river, lake or canal		... in an urban open space		... in a woodland or forest	
		N	%	N	%	N	%	N	%
		Std Error		Std Error		Std Error		Std Error	
<b>Total</b>		181,522,886	6.3	220,852,077	7.7	533,026,113	18.6	333,454,877	11.6
<b>SE</b>		8,162,364	4.5	10,672,742	4.8	33,628,496	6.3	15,725,695	4.7
<b>Who</b>									
Male		83,996,715	46.3	103,708,892	47.0	246,041,466	46.2	157,929,407	47.4
SE		3,672,036	2.0	5,247,495	2.4	16,391,912	3.1	9,443,734	2.8
Female		97,526,171	53.7	117,143,185	53.0	286,984,647	53.8	175,525,470	52.6
SE		4,636,060	2.6	5,823,978	2.6	17,667,527	3.3	6,923,645	2.1
Aged 16-34		31,803,181	17.5	44,258,946	20.0	162,280,364	30.4	65,227,117	19.6
SE		1,681,443	0.9	3,229,461	1.5	9,354,114	1.8	4,323,507	1.3
Aged 35-64		105,567,004	58.2	132,820,661	60.1	282,010,066	52.9	209,383,988	62.8
SE		3,811,011	2.1	4,809,464	2.2	16,231,039	3.0	6,851,452	2.1
Aged 65 and over		44,152,701	24.3	43,772,470	19.8	88,735,682	16.6	58,843,772	17.6
SE		4,052,034	2.2	3,513,161	1.6	8,843,564	1.7	5,339,426	1.6
AB classification		59,789,813	32.9	77,423,058	35.1	144,573,206	27.1	117,328,086	35.2
SE		3,591,996	2.0	5,390,083	2.4	14,503,277	2.7	8,017,218	2.4
C1 classification		55,455,889	30.6	61,377,007	27.8	159,601,478	29.9	95,859,450	28.7
SE		2,774,165	1.5	3,249,700	1.5	11,315,979	2.1	5,593,556	1.7
C2 classification		35,663,653	19.6	42,231,337	19.1	105,135,020	19.7	68,002,071	20.4
SE		1,549,980	0.9	2,698,778	1.2	5,633,779	1.1	2,944,921	0.9
DE classification		30,613,531	16.9	39,820,675	18.0	123,716,409	23.2	52,265,269	15.7
SE		1,809,656	1.0	2,051,314	0.9	6,224,440	1.2	1,871,217	0.6
<b>Why</b>									
Health motivation		77,159,597	42.5	114,592,495	51.9	207,898,833	39.0	185,700,094	55.7
SE		5,524,287	3.0	9,683,622	4.4	24,142,024	4.5	19,027,480	5.7
Relaxation motivation		74,431,178	41.0	86,097,737	39.0	155,276,763	29.1	129,157,460	38.7
SE		5,448,081	3.0	3,781,920	1.7	16,142,569	3.0	11,748,374	3.5
Social motivation		51,372,157	28.3	52,289,709	23.7	115,093,196	21.6	66,418,717	19.9
SE		4,529,129	2.5	5,672,223	2.6	12,511,559	2.3	5,212,362	1.6
<b>When</b>									

Weekday	116,877,975	64.4	145,805,507	66.0	362,755,711	68.1	225,497,558	67.6
SE	10,351,425	5.7	13,256,593	6.0	31,167,197	0.0	17,258,963	5.2
Weekend	64,644,911	35.6	75,046,570	34.0	170,270,402	31.9	107,957,319	32.4
SE	5,210,586	2.9	3,575,427	1.6	9,843,238	1.8	5,071,370	1.5
Spring	50,996,937	28.1	64,604,845	29.3	138,527,678	26.0	91,553,475	27.5
SE	3,656,189	2.0	4,439,489	2.0	9,891,799	1.9	3,429,834	1.0
Summer	50,000,752	27.5	62,232,818	28.2	143,726,339	27.0	83,067,335	24.9
SE	2,303,813	1.3	3,757,206	1.7	11,595,178	2.2	5,557,795	1.7
Autumn	39,800,406	21.9	48,682,341	22.0	130,005,566	24.4	78,278,197	23.5
SE	1,662,950	0.9	3,037,269	1.4	9,957,451	1.9	4,868,463	1.5
Winter	40,724,791	22.4	45,332,073	20.5	120,766,530	22.7	80,555,870	24.2
SE	2,806,925	1.5	2,121,292	1.0	8,077,831	1.5	6,744,776	2.0
2009-2010	176,524,548	13.9	205,271,905	13.3	484,555,539	13.0	279,933,826	12.0
2010-2011	165,777,177	13.0	192,335,977	12.4	404,982,370	10.9	295,859,115	12.7
2011-2012	161,716,911	12.7	213,394,618	13.8	456,942,540	12.2	328,229,583	14.1
2012-2013	183,754,257	14.5	205,047,561	13.3	533,036,704	14.3	318,943,790	13.7
2013-2014	163,325,824	12.9	224,403,778	14.5	589,169,042	15.8	338,817,078	14.5
2014-2015	219,778,330	17.3	226,539,390	14.7	615,182,000	16.5	374,415,930	16.0
2015-2016	199,783,154	15.7	278,971,310	18.0	647,314,595	17.3	397,984,816	17.1

#### Where

East Midlands	5,475,268	3.0	22,774,905	10.3	34,456,799	6.5	28,046,110	8.4
SE	500,817	0.3	2,148,409	1.0	2,257,242	0.4	1,537,088	0.5
East of England	13,902,952	7.7	21,087,514	9.5	54,103,263	10.2	40,322,074	12.1
SE	905,308	0.5	1,599,100	0.7	5,152,018	1.0	2,790,927	0.8
London	2,907,374	1.6	6,296,085	2.9	101,134,458	19.0	9,843,989	3.0
SE	369,509	0.2	870,777	0.4	9,800,770	1.8	1,564,496	0.5
North East	25,433,430	14.0	11,117,746	5.0	23,576,528	4.4	25,124,548	7.5
SE	1,772,019	1.0	1,208,244	0.5	914,140	0.2	2,689,005	0.8
North West	23,277,685	12.8	27,838,823	12.6	82,624,167	15.5	26,426,334	7.9
SE	816,229	0.4	2,394,416	1.1	6,249,264	1.2	3,243,083	1.0
South East	45,504,055	25.1	28,491,617	12.9	72,925,131	13.7	62,386,636	18.7
SE	4,925,816	2.7	1,365,402	0.6	4,664,986	0.9	4,090,647	1.2
South West	39,369,696	21.7	29,917,586	13.5	42,652,077	8.0	53,470,395	16.0
SE	2,342,759	1.3	2,766,819	1.3	3,278,091	0.6	2,724,217	0.8
West Midlands	4,664,040	2.6	38,865,200	17.6	64,627,397	12.1	39,767,692	11.9
SE	485,010	0.3	3,840,958	1.7	4,826,353	0.9	3,272,257	1.0



Yorkshire and The Humber	16,664,811	9.2	30,054,337	13.6	44,260,846	8.3	41,680,408	12.5
SE	981,790	0.5	1,201,012	0.5	1,877,200	0.4	3,144,082	0.9

Notes:

Percentages for motivations can add up to greater than 100% as respondents could select more than one motivation item (see section 2.3.2).

Counts for the survey year variable are annual totals (i.e. the estimated number of visits to the location in that year of sampling). Every other variable represents an annual average (i.e. the average number of visits to that location over the seven years of sampling involving that activity, motivation, season etc.).

Standard errors of the mean represent standard errors across the 7 survey sampling years. Therefore, no standard errors are present for the survey year variable.

Grossing-up weights are applied to estimate frequencies at the English population level. These estimates are made from a total sample size of 130,851 randomly selected visits made in the previous week (each made by a different respondent) over the last seven years of the survey's data collection except for the three motivation variables which are estimated from 30,188 such visits. The reason that this number is less than the total is because these items were only asked every month for the former three waves of the survey. For more information on the weighting procedures and how the grossing-up weights were constructed, see the recent technical report on the survey [20].

### *Responses to Reviewers:*

Many thanks for your submission titled “*Recreational visits to marine and coastal environments in England: Where, what, who, why, and when?*” to the special issue of Marine Policy. We now have the comments from two reviewers which are provided below.

Both Reviewers 1 and 2 have recommended the paper should be accepted subject to minor corrections; both editors have also read the paper, agree with the comments from the reviewers and feel that this is an interesting and topical paper that will sit well within the planned special issue.

We would like to accept the article subject to minor changes. Please consider the comments from both reviewers have said and either modify your text appropriately, or, where you chose not to, explain to the editors why you have decided not make alterations in certain sections.

Can you ensure that your resubmitted article adheres to the Marine Policy Guide for authors <https://www.elsevier.com/journals/marine-policy/0308-597x/guide-for-authors> for instance ensuring that reference styles are correct.

Please confirm if you are happy to submit a revised manuscript by Friday 10th November. If you would like to submit a revision, we would need to have your revised text by Friday 15th December.

### **Reviewer 1**

Recreational visits to marine and coastal environments in England: Where, what, who, why and when?

Overall, this paper should be accepted for publication in the special issue. It presents a topical and much needed addition to the literature and provides a good baseline picture for future studies to develop further on. Additionally, the paper has direct policy implications and can be used by academics, students and importantly planners and managers drivign forward the 'blue growth' agenda.

I felt the paper was well written and structured throughout. It also has a breadth of supporting references useful to augment its findings.

The statistical analysis, whilst fairly descriptive was sufficient and appropriate to this paper.

*We thank the Reviewer for their positive assessment of this paper.*

Only very minor additions:

Reference early on and thence throughout to British Marine statistics could have been used as well - as although primarily 'boating related' - these are a n industry benchmark.

*In response to Reviewer comments, we now refer to British Marine Federation's 2015 report on water sports participation statistics in the first paragraph of the Introduction:*

*"An estimated 12.4 million people participated at least once in marine and coastal recreation in the UK in 2015 ["]"*

*While we cannot directly compare these estimated frequencies with ours (as we examined numbers of visits rather than numbers of people), we now refer to the same statistics in our discussion of walking in Section 4.1 to contextualise (approximately) the frequency with which an individual might visit the coast for the purpose of recreational walking.*

More care could have been taken differentiating between coastal and marine in places eg line 214 / 224 / 292

*We thank the Reviewer for their attention to detail. In response to Reviewer comments, the mention of marine at line 214 has been changed to "coastal" as the activities clearly pertain to on-land recreation; and the instance at line 292 has been changed to "marine and coastal" as we cannot deduce precisely where swimming took place. Line 224 correctly mentions "coastal." In general, it is clear that "beaches" and "other coastline" categories ostensibly refer to coastal rather than marine environments; and we have tried to be more mindful of this terminology throughout. At the same time, we continue the discussion of marine recreation where it is applicable; and maintain the implications of the findings to marine policy.*

Otherwise, I enjoyed this paper and would support its acceptance with these very minor adjustments.

## **Reviewer 2**

I am happy to recommend this paper for publication in the Special Issue of Marine Policy with a few minor amendments. However, please note that neither the Supplementary Table A or Figures 1 and 2 were available in the downloaded document and so I have been unable to comment on them.

I am unsure what is contained in the Supplementary Table A so this comment may not apply. On page 5, line 110 the authors mention a list of 20 activities. As I do not see the entire list anywhere it would be useful if the authors produced an Appendix with the entire list. This also applies to page 6, line 137 where the authors mention 14 reasons for their visit. It would be useful to see the list of 14 reasons also included somewhere such as an Appendix to the paper.

*A list of nineteen activities is indeed present in Supplementary Table A and the twentieth refers to an "any other outdoor activity" option which was omitted from analysis as it was deemed unhelpful to marine planners (this option is only chosen by respondents for comparatively very small numbers of visits anyway). In response to Reviewer comments, this point has been added to the footnote of Supplementary Table A.*

*Conversely, only the main "health," "relaxation," and "social" motivation categories are present in the tables and supplementary files. We feel it would be too lengthy to include all fourteen in a table footnote; but as these are included in MENE's technical report along with their exact wording, we have instead provided a reference (with web link) to the technical report of MENE in the article where the list of fourteen is mentioned. We hope this is an acceptable compromise.*

Some of the grammar and tenses in the paper appear to be incorrect or unclear and I would suggest the author(s) use a grammar checker to make sure that these are correct and make sense. NOTE - I have gone through the first 12 pages and made suggestions in the table below but have not done so for the rest of the paper as it is a time-consuming process.

Standard nomenclature in the UK is “socio-economic classifications” – NOT grades, e.g. lines 17, 18, 122, 126 etc. etc. I suggest the authors use “classifications” throughout.

Specific comments:

Page and line	Comment
1, 11	Suggest saying “regional factors best predict them”
1, 13-14	Change “although the majority involve” to “with the majority involving”
1, 16	Change “equally like” to “equally alike”
2, 33-35	More recently than what? Suggest changing to start sentence with “A 2012 valuation ...” then end the sentence with “... in that year”
2, 43	Change “to create” to “of creating”
2, 45-46	I suggest you say “... describes the UK government’s vision as “a healthy natural environment ....” Currently you have natural environment appearing twice on the same line and this repetition should be avoided
3, 51-52	You say that there is little published evidence and this seems rather definitive. Might read better as “There appears to be little .... however”.
3, 62	Would read better as “The study presented in this paper was .... It used seven years of data ...”
3, 70	Suggest using “can predict” instead of “predicted”
5, 101-103	Could you please identify what the different environments were for a, b and c on these three lines
5, 106	What do you mean by “and so forth” – could either use etc. or improve wording here
6, 133	After occupations I would suggest you add a semi-colon and then add the words “this classification also includes state pensioners ....”

7, 158	You use the word “eudaimonic” and while it might be familiar to some readers it will not necessarily be for all – perhaps you could add a brief definition
8, 169-174	You discuss “odds” here for (a), (b) and (c). As this refers to odds ratios it might be better if you write that in full at (a) and then use OR for subsequent uses
8, 175	It is unclear whether you mean all 35-64 year olds (M&F) the way this sentence is written. Also, do you mean females of all ages? Could make this clearer
8, 175-176	Omit “most” or “highest” as both are not necessary – they are either the most frequent or highest frequency, not both
8, 183	Not all readers will be familiar with R so it would be useful to briefly explain
9, 187	Suggest changing sentence to read “In total, it is estimated that ....”
9, 194	Suggest changing sentence to read “An estimated 99.3 million ...”
9, 200	Change “conducted” to “undertaken”
11, 233	Change to “... than for any other reason”
11, 234	Change to “... were visited more often at weekends” ... “in warmer rather than cooler seasons”
11, 235-236	Change to “... (as compared to London), and in particular ....”
11, 237	Could you provide an example of the environments (e.g. ....)
12, 255	Omit “were” in sentence “South West regions ....”
12, 261	You say “in most latter survey years”. Should this read “later”

*We thank the Reviewer for their attention to detail. In response to Reviewer comments, we have omitted all mention of socioeconomic “grade” and have instead used “classification(s)” as suggested. We have additionally made all the suggested changes in the table above, and have been vigilant in grammar- and spell-checking the rest of the article.*

*Regarding the third entry in the above table, the word “like” was a typo, which should have read “likely” and has now been amended.*

*Regarding the tenth entry, we are not entirely certain what the Reviewer expects, but have assumed that they have mistakenly thought that the five environments listed were more specific locations, rather than general categorisations that people could choose from. We have thus referred to them as “categories” rather than “locations” in the section 2.2.1 to hopefully allay this concern.*

The Tables would benefit from the most significant results being highlighted, e.g. use grey background or put results in bold. This would enable to reader to see, at a glance, what are the most significant OR's

*In response to Reviewer comments, we have added asterisks to odds ratios in tables 1 to 3 denoting .05, .01, and .001 alpha levels. We hope this helps the reader identify more and less significant odds ratios.*

Accepted for publication

*Responses to editors:*

*Author responses to the editor are shown in italics.*

Comments from the editor:

- This paper is now ready, subject to the following formatting requirements:

1. As well as bracketed references to the tables in the text, insert text line breaks with notes to indicate their approximate positions;

*We have now noted in line breaks the desired approximate positions of all tables and figures.*

2. For 'Funding' suggest 'Acknowledgements';

*The 'Funding' section has now been renamed 'Acknowledgements'.*

3. Remove tables and supplementary tables from text file;

*All tables and supplementary tables have now been removed from the main manuscript file.*

4. Upload tables/table captions as individual files;

*The tables and their captions are now present in three separate files.*

5. Upload supplementary tables as a single file;

*The supplementary tables are now present in one single file.*

6. Abstract should be a single paragraph,

*The abstract document has now been reformatted as one single paragraph.*

*Please also note that two sentences in the results section and one sentence in the discussion have been edited as they subtly misrepresented the results. In all cases, the error involved interpreting percentages in Supplementary Table A as though they were proportions of all visits to natural environments, when in fact multiple environments could be visited on the same visit. We hope the editor accepts that these edits do not change the interpretation of our findings as a whole:*

*Previously, "This accounts for 6% of all recreational visits made to natural environments." (Lines 168-9), now reads: "This means 6% of all recreational visits to natural environments included a beach (at least in part)" (Lines 168-9).*

*Previously, "(3.5% of all recreational visits to natural environments)" (Lines 174-5), now reads: "This means 3.5% of visits included an 'other coastline' environment, at least in part." (Lines 175-6).*

*Previously, "Together accounting for 9.5% of all leisure visits to natural environments" (Lines 308-9), now reads: "together meaning that 9.5% of all leisure visits to natural environments involved these locations" (Lines 313-4).*

Accepted for publication